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The Craniometry of Southern New England Indians

BY

MARIAN VERA KNIGHT, A.M.

WITH AN INTRODUCTION BY

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INTRODUCTION.

It has long been a reproach to American Anthropology that so little available material exists in the way of anthropometric data concerning either the skull or the other bones of our aborigines. This is the more remarkable, too, since Morton, the Father of Physical Anthropology in this country, inaugurated this branch of study in the New World by careful measurements of hundreds of crania, especially those of American Indians. But "he was a father who left many friends to the science and even followers, but no real progeny" [Hrdlicka, in Amer. Anthropol., 1914, p. 523], and thus it happens that, while many lines of anthropological research have flourished greatly, but little building material has ever been deposited upon the craniometric foundations laid by the great master. To be sure, much has been done along the lines of descriptive craniology, but in the sense in which the Fuegians have been studied by Martin, the Ainus by Koganei, and the inhabitants of Cameroon by Drontschilow, to name a few of the best, the skull of the American Indian remains but little known.

The best model known to me along this line is the paper by Carr, 1880, who presented numerous careful measurements of the crania of New England Indians; but this paper is now thirty-five years old; it was written when there were great differences both in the measurements taken by different individuals and in the manner of taking them, when the instruments used were almost as individual as the measurements, when there was neither a Frankfort Horizontal nor an International Prescription.

With this need in mind I began some time ago to make a series of measurements upon a few local aboriginal crania collected in and about the town of Hadley, Mass., and shown to be absolutely genuine by the associated objects or the mode of burial. To this I added a few more from local excavations, now in the Gilbert Collection of Amherst College. Since, however, the time and opportunity failed me for continuing this work, I entrusted the entire matter to my pupil, Miss Knight, whose paper, compiled in the Anthropological Laboratory of Smith College, is here presented.

It will be noticed from the list of localities given in Appendix that the skulls studied are confined to the states of Massachusetts and Rhode Island, with the exception of two individuals from Farmington, Connecticut, whose close kinship to the other "river Indians," like the Agawams of Springfield and Longmeadow, is beyond dispute.

This distribution will include the territories of the Narragansetts, the Eastern Niantics, the Wampanoags, the Nipmucs, the Massachusetts, and the various divisions of the Connecticut River Indians (Agawam, Nonotuck, Pocumtuck), together with the tribes of the Massachusetts seaboard, north of Boston, chiefly tributaries of the Pennacook; and since the presumable date of the graves from which the skulls were obtained was at the earliest not many centuries before the colonization by the Whites, it is safe to assume that all the individuals taken were from an homogeneous Algonkin stock. It will thus be noted that there is no inclusion of the Pequot-Mohegan intruders, who seem to have come from the middle Hudson region some generations before the advent of the Whites, and which, although definitely Algonkin, may not have been quite so closely related as were the others. Thus it would seem that the material here treated is that of a single aboriginal type, or expanded family, and that the individual differences are only such as would be expected under such conditions.

HARRIS HAWTHORNE WILDER.

Smith College, January 12th, 1915.

PROBLEM.

The following investigation is an attempt to determine as accurately and as completely as possible, by the anthropological methods in use at present, the racial cranial characteristics of the Southern New England Indian.

MATERIAL.

The material was obtained from the collections at Smith College; Amherst College; Peabody Museum, Cambridge; Park Museum, Providence; one, from the Public Library of Holyoke; three, from Phillips Andover Academy; and several from Charles Carr, Warren, R. I. Only those skulls were selected which, from the places of burial, were known to be probable members of the closely related Algonkian tribes; Nipmucks, Massachusetts, Niantics, Narragansetts, and Wampanoags. Therefore, no attempt is made to make any statement in regard to the American Indian in general, but merely concerning those of this restricted area.

I am deeply indebted to Dr. Harris Hawthorne Wilder, under whose direction this work has been carried on, for his preliminary instruction and constant advice; I wish also to express my appreciation of the many kindnesses extended to me, during my visits at Amherst and Cambridge, by Prof. John Mason Tyler, Prof. Frederic Brewster Loomis and Mr. Harold Plough at Amherst and by Mr. Charles C. Willoughby and Dr. Ernest Hooton at Cambridge. Acknowledgement is due to Mr. Warren King Moorehead, Mr. Charles Carr, Mr. Frank G. Willcox, and Mr. Harold L. Madison for the use of their material.

LENGTH-BREADTH INDEX.

The extremes of variation in the greatest length line in the male are between 169 and 206.5 mm.,* the average length being 182.2. For the female, the extremes are 158 and 188 mm., the average, 175.5 mm.

The greatest breadth in the male lies between 120 and 151 mm., the average, 134 mm.; for the female, 124 and 145 mm. with an average of 132 mm.

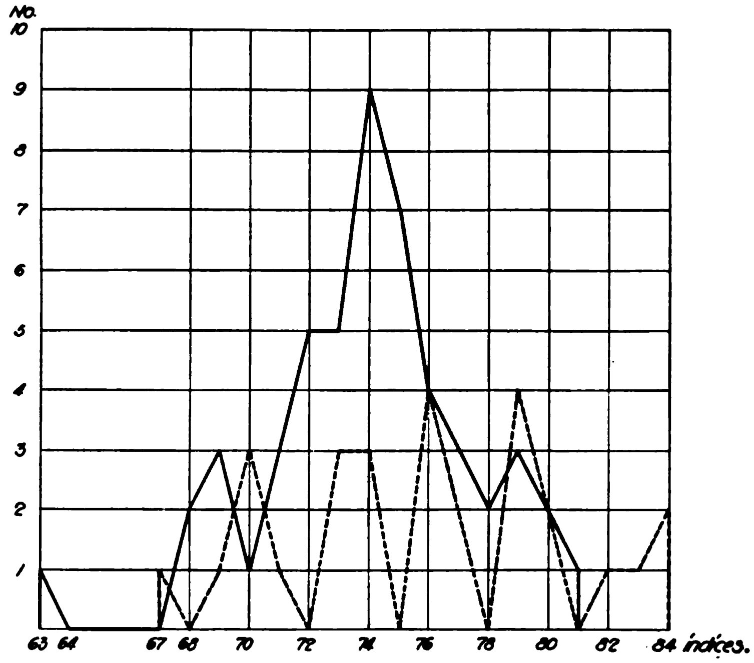
There seems to be a slight sexual difference; the females are not only smaller but also somewhat broader, i. e., more brachycephalic.

The frequency curves of the length-breadth indices, figures 1 and 2, show the modes for the females to be 76 and 79 with two smaller ones at 70 and 73 or 74. This curve, therefore, seems to have no clearly defined mode, due, no doubt, to lack of numbers. One might

---

* An unusually large skull found in Warren, R. I. From the location and from the associated objects in the grave with the body, it was undoubtedly the skull of an important Wampanoag sagamore or councillor, of the mid-seventeenth century.

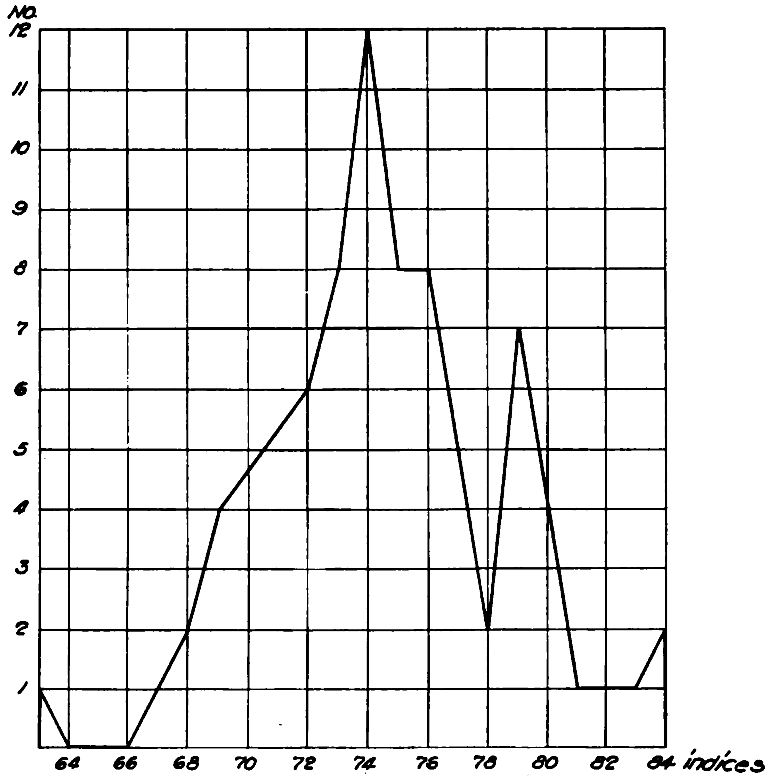
LENGTH-BREADTH INDICES.
NEW ENGLAND INDIANS.



—— Males 48 Extremes 81.5..63 4
---- Females 29 Extremes 84.4..67.0

Fig. 1

LENGTH-BREADTH INDICES,
NEW ENGLAND INDIANS.



77 Individuals both Male and Female

Fig. 2

expect it to come at 75, which is the average of the indices. It is noticeable that the extremes for the female tend more toward the brachycephalic than the dolichocephalic end of the figures, while the males are the reverse. The males have a very clearly defined mode at 75. These same conclusions are reached from a study of the table given here (Table I). The fact that there are no skulls under the class hyperbrachycephalic is significant.

TABLE I.

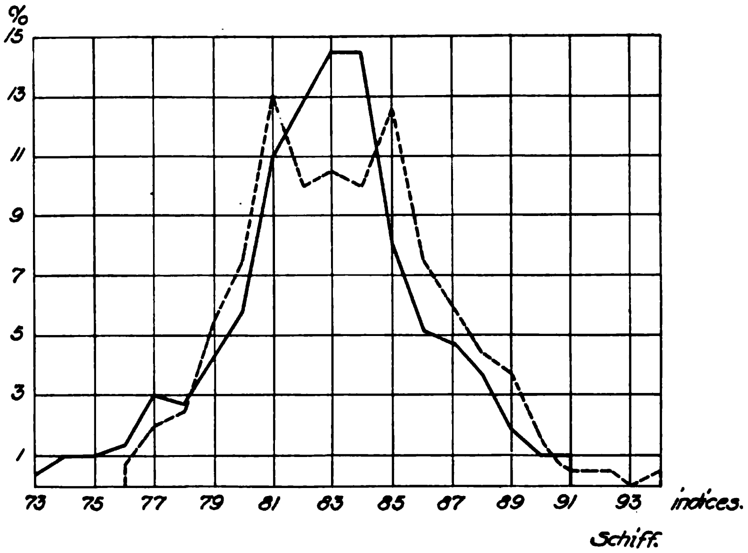
LENGTH-BREADTH INDICES.

		Male		Female	
Index Group		Number	Percent	Number	Percent
Hyperdolichocephalic	up to 69.9	7	14.5	2	6.8
Dolichocephalic	70.0–74.9	23	47.8	12	41.3
Mesocephalic	75.0–79.9	15	31.2	11	37.9
Brachycephalic	80.0–84.9	3	6.2	4	13.7
Hyperbrachycephalic	85.0 and over	0	0	0	0

In the Czechs, a good type of broad heads, the modes of the frequency curves of the length-breadth indices for the males and females lie at 79 and 83 and the range of variation is from 73 to 94, figure 3.

LENGTH-BREADTH INDICES.

CZECHS.



—— MALES 294

---- FEMALES 160

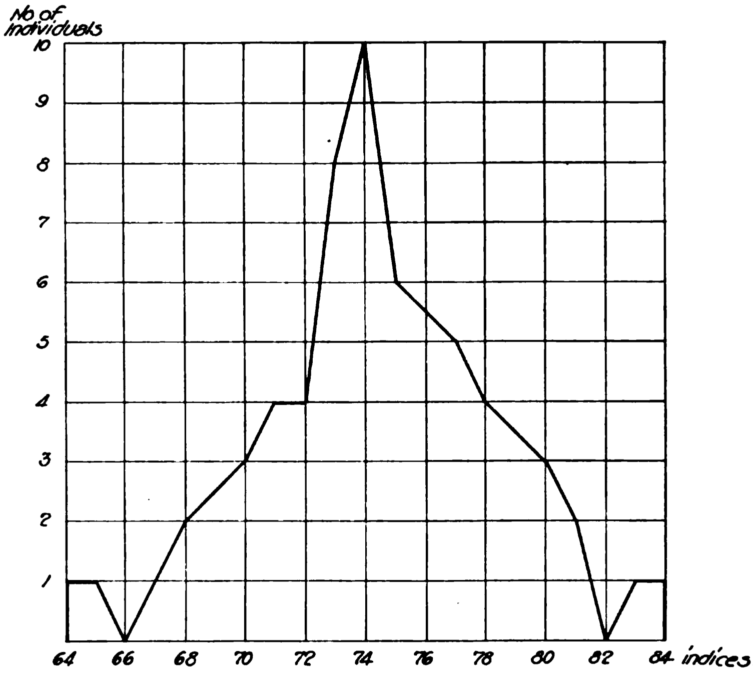
FIG. 3

LENGTH-TOTAL HEIGHT INDEX.

The average length-total height index, the latter taken from basion to bregma, in the male is 74.73 and in the female 75.9, figure 4, showing that the females have a slightly higher head than the males. While 60% of the females are in the Hypsicephalic Class, 57.5% of the males are Orthocephalic, Table II. The extremes between which the indices vary in the female are 65.57–84.12; in the male, 64.36–81.67, showing again a tendency on the part of the female to a relatively higher head. The actual average total height of the female, 133.2 mm., is, of course, less than that of the male, 136 mm.

LENGTH-HEIGHT INDICES.

NEW ENGLAND INDIANS.



65 Individuals

Fig. 4

TABLE II.

Length-Height Indices.

		Female		Male	
Index Group		Number	Percent	Number	Percent
Chamaecephalic	up to 69.9	4	16	3	7.5
Orthocephalic	70.0–74.9	6	24	23	57.5
Hypsicephalic	75.0 and over	15	60	14	35.0

LENGTH-AURICULAR HEIGHT INDEX.

Using the auricular height instead of the basion-bregma height in determining the relation between the length and height of the skull, we find both males and females are in the Hypsicephalic Class, with average indices of 63.19 and 65.14 respectively. The actual average auricular height in the female is 113.59; male, 115.4. This leads to the conclusion that the female skull is slightly longer relatively from the auditory meatus to the base.

TABLE III.

Scale of Length–Height Indices.

Chamaecephalic	up to 57.9
Orthocephalic	58.0–62.9
Hypsicephalic	63.0 and over

SUPERIOR FACE.

The face on the living may be conveniently divided into three areas, (1) the forehead, which is bounded by the eyebrows, (2) the superior face, between the eyebrows and the mouth opening, and (3) the lower face, the remaining portion, the mandible. These do not correspond with the anatomical divisions of the skull; for example, the upper boundary of the forehead is the somewhat variable hairline which is of course absent on the skull, and the study of the forehead is most naturally included in connection with the frontal bone. The lower face, i. e., the mandible, is detached from the cranium and is adjustable only with some difficulty, thus forming a source of error; moreover, it is very often either missing entirely or broken. Hence, the superior face seems to offer the most satisfactory field for study. The different types of superior face are best demonstrated by the index of the height and breadth lines. A low index means a broad face, chamaeprosopic, while a high one shows a long and narrow face, leptoprosopic. The superior facial index is found by dividing the distance between the nasion and prosthion by the bizygomatic distance as a unit. Thus $\frac{n-pr \times 100}{zy-zy}$ = superior facial index. See Table IV.

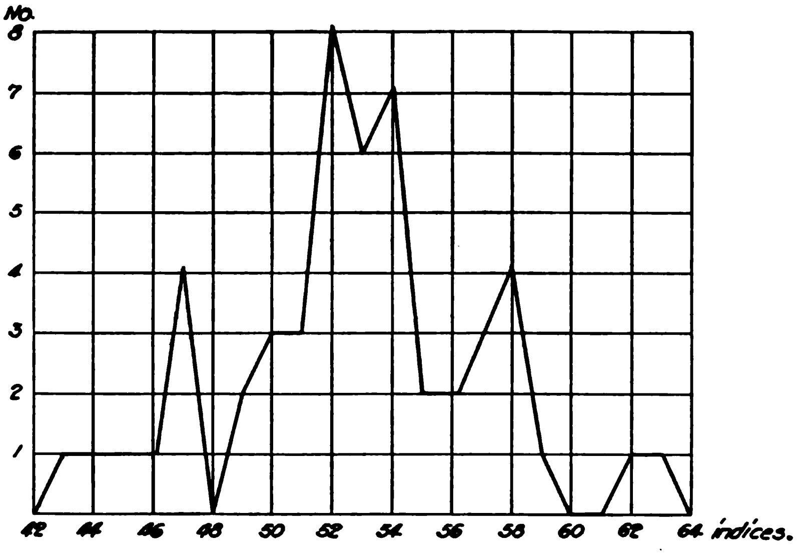
TABLE IV.

Scale of Superior Facial Indices.

Hyperchamaeprosopic	up to 44.9
Chamaeprosopic	45–49.9
Mesoprosopic	50–54.9
Leptoprosopic	55–59.9
Hyperleptoprosopic	60 and over

The average superior facial height for the female is 67.3 mm., the average breadth is 127.6 mm.; for the male they are 69.2 mm. and 132.0 mm. respectively. It is noticeable that while the average indices are the same for the two sexes, showing the same relative facial proportions, yet the actual size of the female is smaller and its limits of variation more nearly approach the mean. The average index, 52.7, which was found by taking the average of all the indices and, as a check, by finding the index of the average facial length

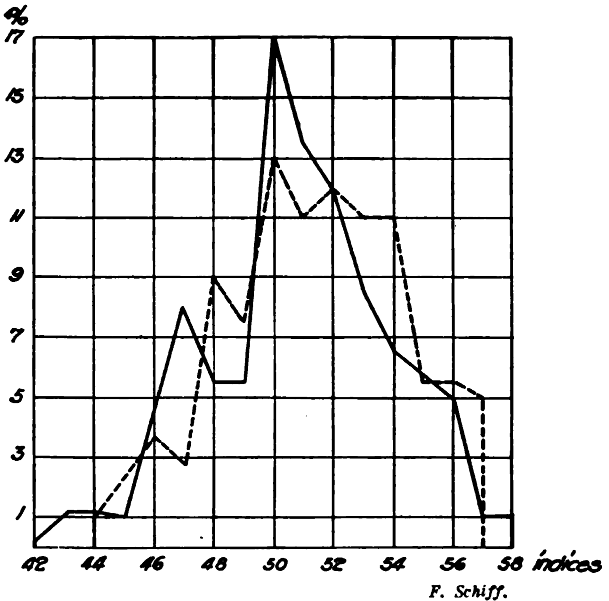
SUPERIOR FACIAL INDICES.
NEW ENGLAND INDIANS.



49 Individuals

Fig. 5

SUPERIOR FACIAL INDICES.
BOHEMIANS.



F. Schiff.

—— 265 Males
---- 157 Females

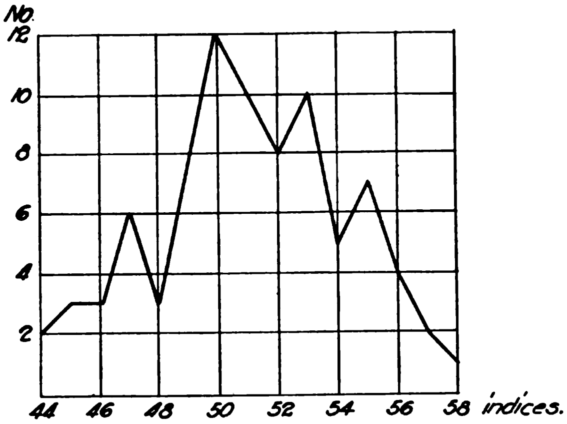
Fig. 6

and breadth, is the same as the mode of the frequency curve of these indices which signifies a comparatively small number of extremes.

The frequency curves in figures 5, 6, and 7, show that the typical facial index of the Southern New England Indian is 52.7, that of the Czech (Bohemian) 50 (Schiff 1912); and that of the African Negro, 50 (Drontschilow 1913). These comparative figures show that the typical face of the New England Indian is somewhat narrower than that of the Negro or Slav.

SUPERIOR FACIAL INDICES.

AFRICAN NEGROES (KAMERUNS).



Drontschilow.

84 INDIVIDUALS

FIG. 7

Tables V and VI show the percentage of individuals falling under the five different classes of broad or narrow faces. A comparison shows that among the specimens measured, there were no females in the Hyperleptoprosopic Class and a smaller percent than among the males in the class Hyperchamaeprosopic, another example of the conservatism of the female.

TABLE V.

SUPERIOR FACIAL INDICES.

Males.	Percent
Hyperchamaeprosopic	9.4
Chamaeprosopic	15.6
Mesoprosopic	56.2
Leptoprosopic	12.5
Hyperleptoprosopic	6.2

Extremes 42.75–62.71.

TABLE VI.

SUPERIOR FACIAL INDICES.

Females.	Percent
Hyperchamaeprosopic	5.8
Chamaeprosopic	17.6
Mesoprosopic	47.0
Leptoprosopic	29.4

Extremes 43.51–58.59.

TOTAL FACIAL INDEX.

The total facial index could be obtained in only a very few specimens because the mandible was either entirely missing or badly broken. The average index of 10 females, Table VII, is 87.84; of 17 males, 84.33.

TABLE VII.

Total Facial Indices.

Index Group		Females		Males	
		Number	Percent	Number	Percent
Hyperchamaeprosopic	up to 74.9	0	0	1	5.88
Chamaeprosopic	75.0–84.9	3	30	8	47.06
Mesoprosopic	85.0–89.9	4	40	5	29.41
Leptoprosopic	90.0–99.9	3	40	3	17.65
Hyperleptoprosopic	100.0 and over	0	0	0	.0

The females show a tendency to be more mesoprosopic, while the males are more chamaeprosopic. This is in accord with the conclusions obtained from a study of the superior facial indices.

A possible correlation between the shape of the head and that of the face, which suggests itself in this connection, is shown by combining the Length-Breadth and Superior Facial Indices, and calculating the percentage of each combination (Table VIII). From this it will be seen that 29.5% of the Dolichocephalic skulls, and 12.2% of the Mesocephalic skulls are Mesoprosopic. 10.2% of the Mesocephalic skulls are Leptoprosopic. These results do not bear out the idea of correlation.

TABLE VIII.

Combination of Length-Breadth and Superior Facial Indices.

		Hyperchamae-prosopic up to 44.9	Chamae-prosopic 45.0–49.9	Meso-prosopic 50.0–54.9	Lepto-prosopic 55.0–59.9	Hyperlepto-prosopic 60 and over
up to 69.9	Hyperdolichocephalic ..	0	0	3- 5.9%	1- 2.0%	2–4.0%
70.0–74.9	Dolichocephalic	0	3–5.9%	14–29.5%	2- 4.0%	0
75.0–79.9	Mesocephalic	3–5.9%	4–8.1%	6–12.2%	5–10.2%	0
80.0–84.9	Brachycephalic	0	1–2.0%	4- 8.1%	1- 2.0%	0
85.0–89.9	Hyperbrachycephalic ..	0	0	0	0	0

NASAL INDEX.

The nasal height, taken from nasion to naso-spinale, varies from 39-57 mm., with an average of 50.33 mm. The breadth varies from 21-31 mm., with 25.77 mm. as the average. The mode of the frequency curve of the nasal indices is at 50.0, figure 8, showing that the larger number of indices fall in the classes Mesorrhine and Chamaerrhine. See Table IX.

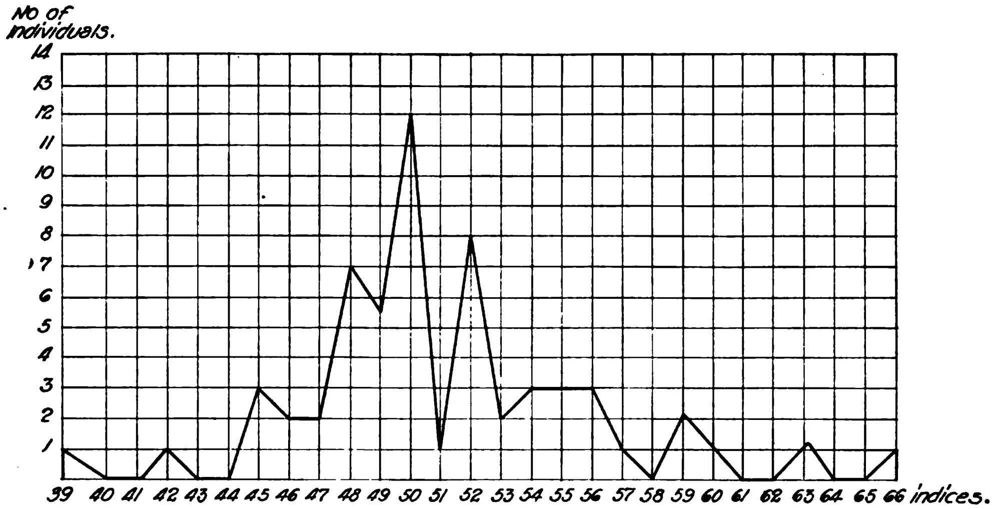
TABLE IX.

Nasal Indices, 58 Individuals.

Index Group		Number	Percent
Leptorrhine	up to 46.9	7	12.07
Mesorrhine	47.0–50.9	26	44.83
Chamaerrhine	51.0–57.9	19	32.76
Hyperchamaerrhine	58.0 and over	6	10.34

For comparison with two sets of particularly broad noses, Slav and Negro, notice the curves in figure 9.

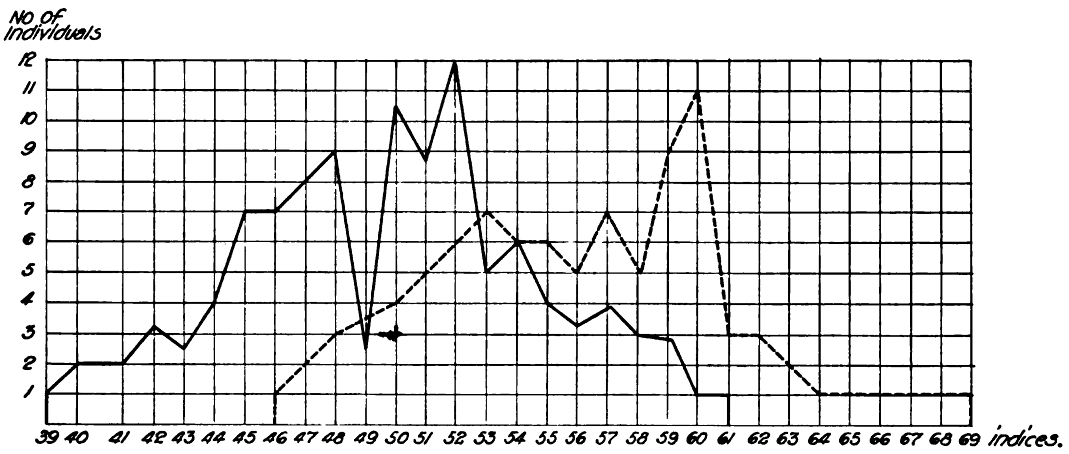
NASAL INDICES.



New England Indians 58 Skulls

Fig. 8

NASAL INDICES.



Kameruns 90 Skulls ----

Czechs 435 Skulls ——

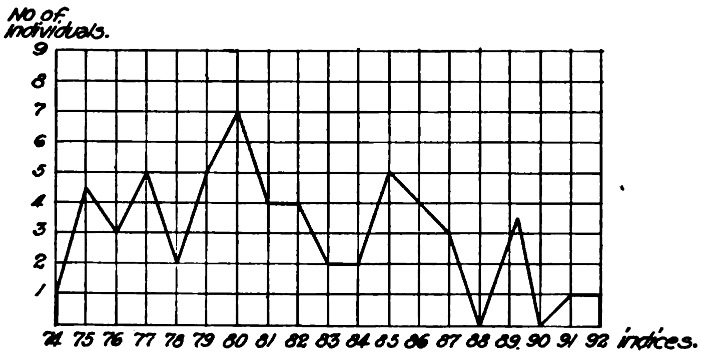
Fig. 9

ORBITAL INDEX.

The method of measuring the orbit used for this work was that of the prescriptions of the International Congress at Monaco in 1906. The orbital breadth is the distance from the fronto-maxillare, parallel to the direction of the upper and lower rims, and extending to the outermost point, the ectoconchion. The orbital height is the distance from the middle point of the lower rim, perpendicular to the orbital breadth, and extending to the upper rim. In all cases both orbits were measured, if present, and the mean used to form the index.

The orbital height in the male varies between 31-36 mm., the average is 33.83 mm.; the breadth varies between 39-47 mm., with 42.54 mm. as the average. The female orbit varies in height from 31-36.5 mm., with 33.78 mm. as the average; and in breadth from 36-43 mm., with 41.56 mm. as the average, figures 10 and 11.

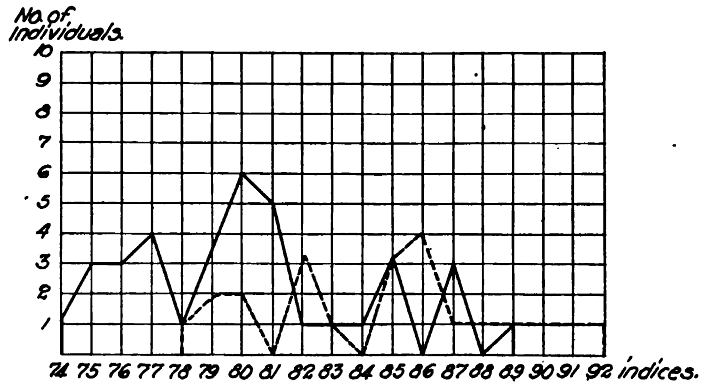
ORBITAL INDICES.
MALE AND FEMALE.



57 New England Indians

Fig. 10

ORBITAL INDICES.
NEW ENGLAND INDIANS.



36 Males ——

21 Females ----

Fig. 11

TABLE X.
ORBITAL INDICES.

Index Group		36 Males		21 Females	
		Number	Percent	Number	Percent
Chamaeconch	70.2–74.9	5	13.89	0	.0
Mesoconch	75.0–84.9	27	75.0	10	47.62
Hypsiconch	85.0 and over	4	11.11	11	52.38

Table X shows that there is a slight sexual difference in the size of the orbits, the orbit of the female being somewhat higher than that of the male.

MAXILLO-ALVEOLAR INDEX.

The method used to measure the length of the maxillo-alveolar border is that employed by Fischer, that is, the distance from the most anterior point of the alveolar border, between the two middle incisors, to the median point in the line tangent to the most posterior extremities of the alveolar borders. This latter point is obtained by placing a fine knitting needle in the grooves between the border and the lateral plate of the pterygoid process, and using its middle point. The breadth is the greatest transverse distance between the outer borders.

In the males, the maxillo-alveolar length varies from 46-60 mm., the average being 53.36 mm.; in the females, the length varies from 42-57 mm., the average being 51.8 mm. The breadth varies, in the males, from 53-72 mm., average, 61.39 mm.; in the females, from 44-67 mm., average, 69.62 mm.

PALATAL INDEX.

The palatal length used is the distance between the median point of the line tangent to the inner alveolar borders of the two middle upper incisors (orale) and the median point of the line tangent to the two indentations in the posterior border of the palate (Staphylion). The palatal breadth is the distance from the inner alveolar border of the second molar to the corresponding point on the opposite side.

The palatal length varies, in the male, from 43-51 mm., average, 46.11 mm.; in the female, from 37-52 mm., average 45.5 mm. The breadth varies, in the male, from 32-45 mm., average, 36.5 mm.; in the female, from 30-45 mm., average, 38.04 mm.

The palatal indices vary from 65.31 to 107.14. The following, Table XI, shows the distribution in the three usual classes. If there were two more classes given, Hyperleptostaphyline and Hyperbrachystaphyline, it would be seen that the indices would be distributed about evenly in all five classes. In other words, there seems to be no marked tendency toward a particularly broad or narrow palate in these skulls.

TABLE XI.

PALATAL INDICES.

Index Group		36 Males		23 Females	
		Number	Percent	Number	Percent
Leptostaphyline	up to 79.9	11	30.56	9	36.13
Mesostaphyline	80.0–84.9	9	25.9	5	21.74
Brachystaphyline	85.0 and over	16	44.44	9	34.13

SAGITTAL ARCS OF THE MEDIAN SKULL BONES.

The relations between the three sagittal arcs of the frontal, parietal and occipital bones to each other and to their respective chords give the proportions and amount of curvature of the cranium.

TABLE XII.

TABLE SHOWING THE AMOUNT OF VARIATION IN THE SEPARATE ARCS.

	Female		Male	
	Extremes	Average	Extremes	Average
Frontal arc	113–137 mm.	123.0 mm.	112–142 mm.	126.2 mm.
Parietal "	101–129 mm.	119.4 mm.	101–129 mm.	122.7 mm.
Occipital "	101–137 mm.	113.3 mm.	101–147 mm.	118.8 mm.

TABLE XIII.

TABLE SHOWING THE AMOUNT OF VARIATION IN THE SEPARATE CHORDS.

	Female		Male	
	Extremes	Average	Extremes	Average
Frontal chord	102–116 mm.	108.8 mm.	104–127 mm.	113.6 mm.
Parietal "	96–117 mm.	107.2 mm.	99–121 mm.	109.6 mm.
Occipital "	89–114 mm.	96.8 mm.	85–109 mm.	97.8 mm.

Schwalbe has shown in his paper on Pithecanthropus (Ztschr. f. Morphol. u. Anthrop., Bd. 1, S. 187) that when the frontal arc is more than the parietal arc, that is, when the index, obtained by finding the value of the parietal arc in terms of the frontal as a unit, is less than 100.0%, the skull more nearly approaches the condition in the anthropoids. (See Table XIV.)

TABLE XIV.

Frontal–Parietal Relation in Representative Primates and Races.

Species	Length of Frontal arc	Length of Parietal arc	Index $\frac{lp \times 100}{lf}$
Lemur mongoz	33	22	66.6
Cebus capucinus	65	27	41.5
Cynocephalus babuin	66	52	78.8
Cercopithecus sabaeus	56	43	76.7
Hylobates leuciscus	54	36	66.6
" syndactylus	72	44	61.1
Orang ad.	72	55	76.2
Troglodytes niger adult female	75	62	82.6
Pithecanthropus; point b	130	93	71.1
" " c	110	113	102.7
Average of b and c	120	103	85.8
Spy 1	115	120	104.3
Spy 2	124	120	96.7
Neanderthal	133	119	89.4
Egisheim	135	124	91.8
Chinese	130	120	92.3
Lapp	130	121	93.1
Russian	129	121	93.8
Australian	120	120	100.0
Alsatian	121	133	109.9
Dyak	116	130	112.0

After Schwalbe.

TABLE XV.

Table Showing the Relation Between the Parietal and Frontal Arcs.

Males.

	F<P		F>P		F=P	
Index Group	Number	Percent	Number	Percent	Number	Percent
Hyperdolichocephalic	4	7.41	4	7.41	1	1.85
Dolichocephalic	7	11.11	17	29.63	1	1.85
Mesocephalic	4	7.41	9	16.67	0	0
Brachycephalic	1	1.85	2	3.70	0	0
?	1	1.85	5	9.26	0	0

Females.

	F<P		F>P		F=P	
Index Group	Number	Percent	Number	Percent	Number	Percent
Hyperdolichocephalic	2	7.69	0	0	0	0
Dolichocephalic	3	11.54	6	23.08	0	0
Mesocephalic	3	11.54	7	26.92	0	0
Brachycephalic	1	3.85	4	15.38	0	0
Total	26	32.50	54	67.50	2	2.50

From Table XV, it is noticeable that, of the 80 skulls measured for this point, 54 or 67.50% of them have the frontal larger than the parietal, and 26 or 32.50% have the frontal less than the parietal, while 2 or 2.50% have the two arcs equal. 68.52% of the females and 65.38% of the males have the frontal larger than the parietal. Schwalbe and Drontschilow are both of the opinion that the Brachycephalic forms show more Simian characteristics in this relation than the Dolichocephalic. While there are very few Brachycephalic forms among the Indians studied, it is true that the Dolichocephalic heads are less apelike in the fronto-parietal relation than the Mesocephalic. See figure 12.

The amount of bulge in these bones is shown by the relation of the arc to its chord; the higher the index, the more nearly do the two approach equality, and the less the bulge. Figure 13 shows that in the Indian the most frequent frontal index is 88; the parietal, 89; the occipital, 83. The occipital has by far the greatest protuberance of the three bones, for many of the indices run below 80. The occipital bone of the New England Indian is considerably more bulging on the whole than that of the other races with which it is compared in the curves in figure 14, the Old Egyptian, Kamerun, Telei and Czech. From Table XVI, we find that 15 of the 47 males, or 31.9%, and 6 of the 25 females, or 24%, have the occipital arc larger than the parietal; while Frizzi found 9 out of 44, or 20.45%, in his Telei. In only 8 cases out of 72 is the frontal arc less than the occipital; in all the remaining cases, it is greater.

TABLE XVI.

PARIETO-OCCIPITAL INDICES.

Arcs.

Males (47 Individuals).

	$P>O$		$P<O$		$P=O$	
Index Group	Number	Percent	Number	Percent	Number	Percent
Hyperdolichocephalic	7	14.89	2	4.26	0	0
Dolichocephalic	9	19.15	8	17.02	2	4.26
Mesocephalic	8	17.02	3	6.38	2	4.26
Brachycephalic	2	4.26	0	0	0	0
?	2	4.26	2	4.26	0	0
TOTAL	28	59.57	15	31.91	4	8.51

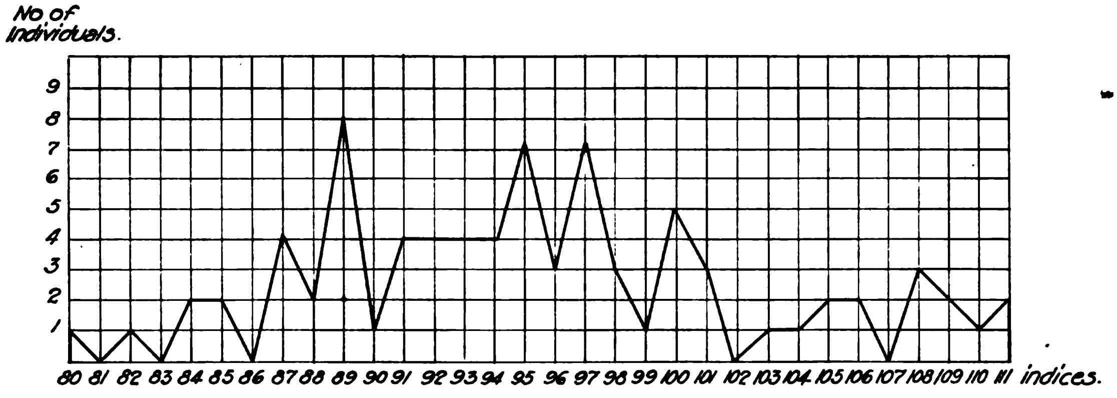
Females (25 Individuals).

	$P>O$		$P<O$		$P=O$	
Index Group	Number	Percent	Number	Percent	Number	Percent
Hyperdolichocephalic	2	8.0	0	0	0	0
Dolichocephalic	5	20.0	3	12.0	0	0
Mesocephalic	7	28.0	3	12.0	0	0
Brachycephalic	3	12.0	0	0	1	4.0
TOTAL	17	68.0	6	24.0	1	4.0

FRONTO-PARIETAL INDICES.

NEW ENGLAND INDIANS.

ARCS.

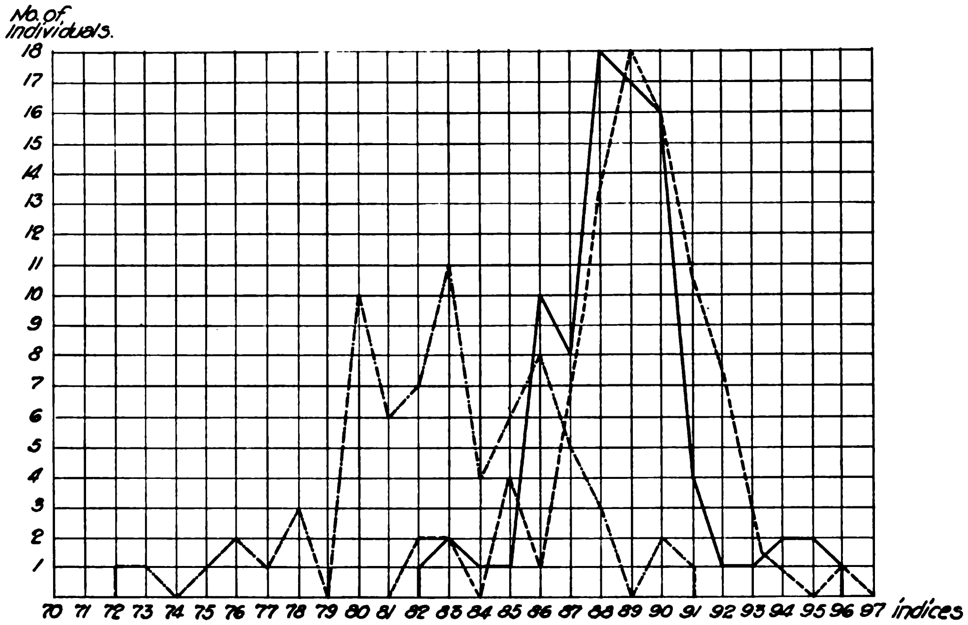


80 INDIVIDUALS

FIG. 12

RELATION OF ARC TO CHORD.

ARC TO CHORD INDICES OF FRONTAL, PARIETAL, AND OCCIPITAL BONES.

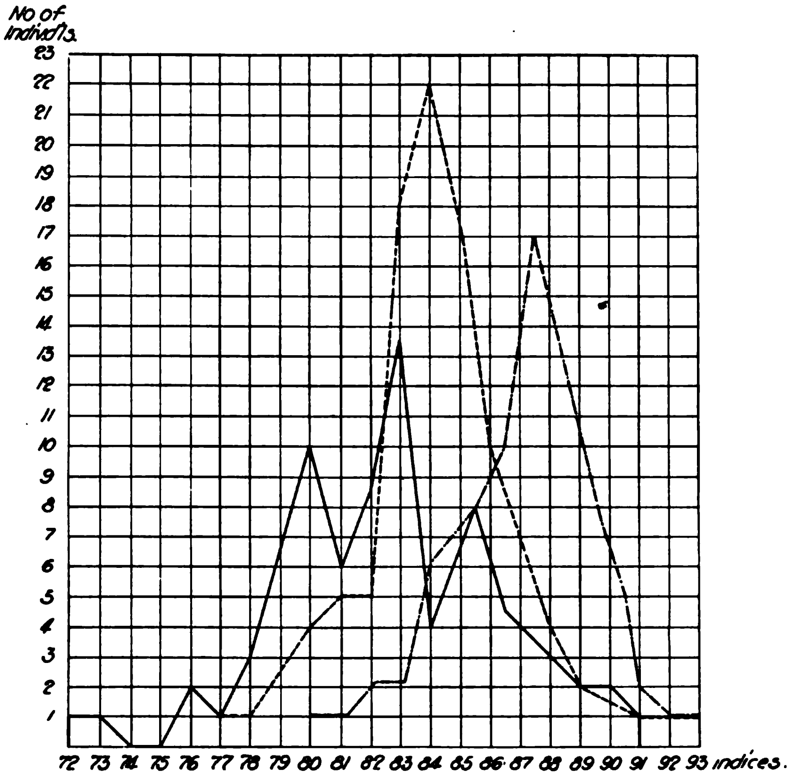


FRONTAL ARC TO CHORD INDICES ———
PARIETAL " " " ------
OCCIPITAL " " " —·—·—

FIG. 13

OCCIPITAL INDICES IN SEVERAL RACES.

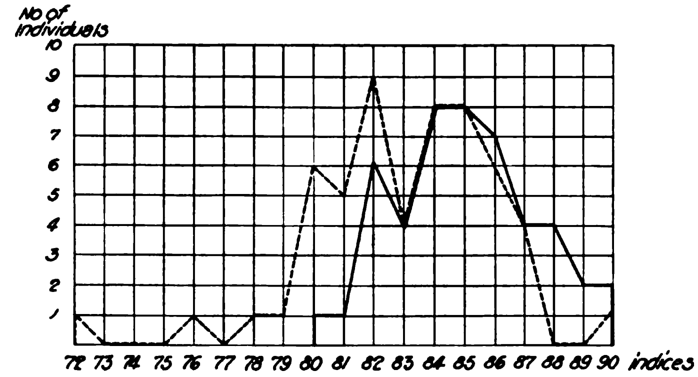
ARC TO CHORD.



OLD EGYPTIANS ------

KAMERUNS —·—·—·

NEW ENGLAND INDIANS ———



TELEI OF BOUGAINVILLE ———

CZECHS ------

FIG. 14

TRANSVERSE MEASUREMENTS.

The following, Table XVII, gives the transverse measurements, the extremes of variation, and the mean of each one.

TABLE XVII.

TRANSVERSE MEASUREMENTS.

	Males.		Females.	
Measurement	Extremes	Mean	Extremes	Mean
Zygomatic breadth	110–147 mm.	132.2 mm.	121–135 mm.	127.3 mm.
Biauricular breadth	104–138 mm.	123.2 mm.	112–128 mm.	120.3 mm.
Intercoronal breadth	101–123 mm.	119.1 mm.	99–125 mm.	111.3 mm.
Least frontal breadth	82–108 mm.	93.2 mm.	82– 99 mm.	90.0 mm.
Inter-zygomatico maxillare	96–106 mm.	105.9 mm.	90–106 mm.	99.3 mm.
Interlacrimal breadth	18– 27 mm.	23.6 mm.	92–104 mm.	22.8 mm.
Inter-frontomalare temporale	92–104 mm.	98.0 mm.	85–100 mm.	93.0 mm.
Greatest cranial breadth	120–151 mm.	136.2 mm.	126–141 mm.	133.6 mm.
Biasterial breadth	96–124 mm.	107.8 mm.	97–111 mm.	107.1 mm.
Bimastoid breadth	90–124 mm.	105.5 mm.	88–106 mm.	99.4 mm.

From these measurements, Table XVII, a number of indices may be computed in order to show the relation of these breadths to each other.

FRONTO-BIORBITAL INDEX.

The fronto-biorbital index is the index obtained by using the inter-frontomalare temporal breadth as a unit and expressing the value of the least frontal breadth in terms of this unit. This index has a range from 80.53 to 96.84.

TRANSVERSE FRONTAL INDEX.

The transverse frontal index is obtained by expressing the value of the least frontal breadth in terms of the greatest frontal breadth, the intercoronal. This index varies, in the male, from 73.17 to 89.91; in the female, from 76.0 to 87.88. It shows the degree of lateral arching of the frontals, and would be caused by more or less development of the frontal lobes of the brain.

FRONTO-MALAR INDEX.

The fronto-malar index expresses the relation of the least frontal breadth in terms of the bizygomatic breadth. The extremes of variation of this index are 64.49 and 76.23. The curve in figure 15 is not very smooth but is sufficient to show that the mode would be at either 67 or 68 if a larger number of indices could have been plotted. The Kameruns having a much broader face, show, in the curve, figure 16, that the mode is at 75.

FRONTO-JUGAL INDEX.
NEW ENGLAND INDIANS.

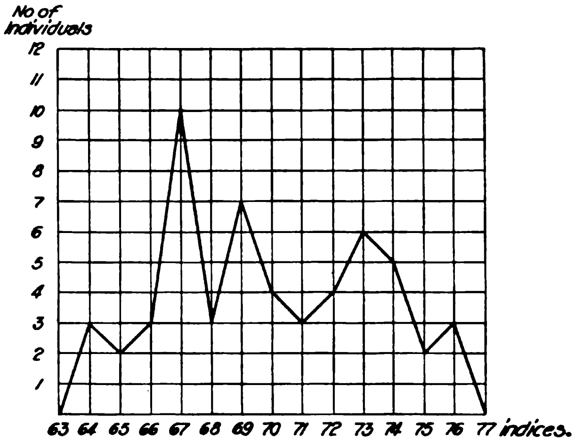


FIG. 15

FRONTO-JUGAL INDEX.
91 KAMERUNS.

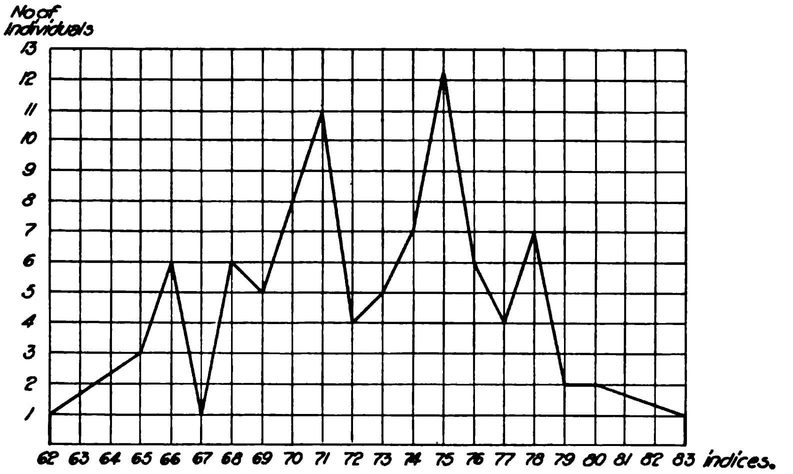


FIG. 16

CRANIO-FACIAL INDEX.

The cranio-facial index expresses the relation of the bizygomatic breadth to the greatest cranial breadth in terms of the latter. This index signifies a prevalence of cranial rather than facial development. The extremes of variation of this index are 85.71 and 109.02. The mode of the frequency curve, figure 17, is at 97, but the indices are not heavily massed at the mode, thus making a more attenuated curve. The frequency curve of the cranio-facial indices of the Kameruns given in figure 18 shows a mode at 96 and two smaller ones at 99 and 102.

CRANIO-FACIAL INDEX.

55 NEW ENGLAND INDIANS.

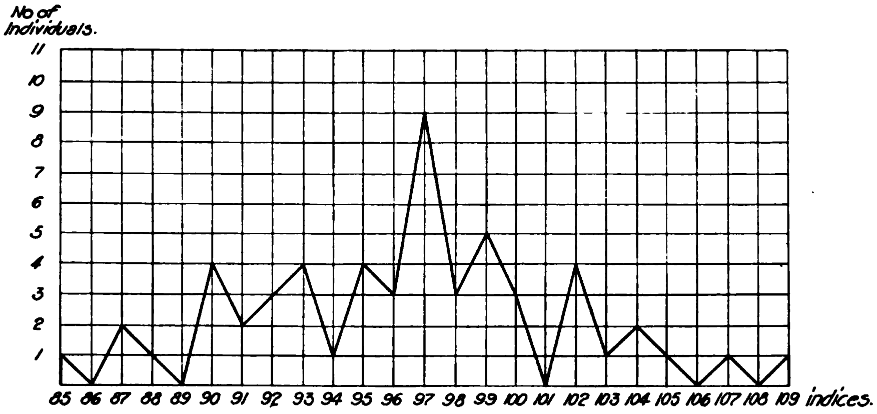


FIG. 17

CRANIO-FACIAL INDEX.

76 KAMERUNS.

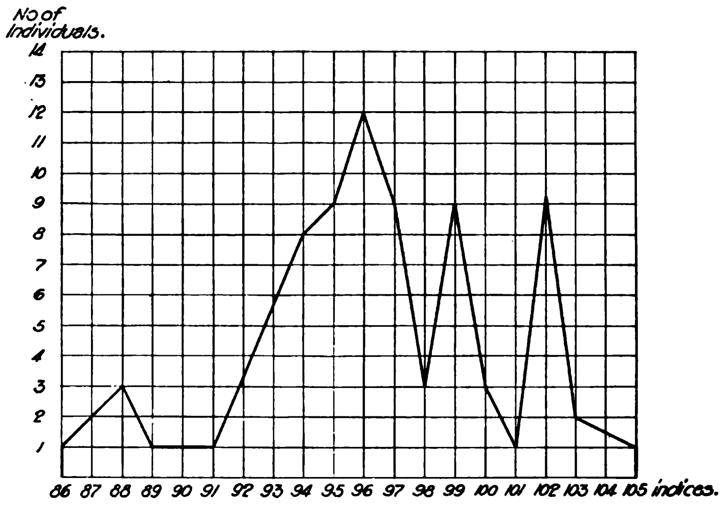


FIG. 18

TRANSVERSE FRONTO-PARIETAL INDEX.

The transverse fronto-parietal index expresses the relation of the least frontal breadth and the greatest cranial breadth in terms of the latter. The extremes of variation of this index are 60.54 and 78.26.

TOTAL SAGITTAL ARC.

The total sagittal arc, from nasion to opisthion, Table XVIII, varies from 336-398 mm. in the male, with the majority lying between 360 mm. and 380 mm.; that of the female varies between 330-383 mm., with the majority between 350 mm. and 370 mm.

TABLE XVIII.

TOTAL SAGITTAL ARC.

Male		Female	
Total Arc	Number	Total Arc	Number
330–340 mm.	1	330–340 mm.	4
340–350 mm.	2	340–350 mm.	1
350–360 mm.	6	350–360 mm.	11
360–370 mm.	15	360–370 mm.	4
370–380 mm.	13	370–380 mm.	4
380–390 mm.	5	380–390 mm.	1
390–400 mm.	3		

TRANSVERSE ARC.

The transverse arc, from porion to porion, perpendicular to the Frankfort Horizontal, Table XIX, varies in the male from 301-370 mm., the majority lying between 310 mm. and 340 mm. The females vary between 270-337 mm., with the majority between 300 mm. and 330 mm.

TABLE XIX.

TRANSVERSE ARC FROM PORION TO PORION.

Male		Female	
Transverse Arc	Number	Transverse Arc	Number
270–280 mm.	1	300–310 mm.	5
280–290 mm.	0	310–320 mm.	14
290–300 mm.	4	320–330 mm.	11
300–310 mm.	6	330–340 mm.	9
310–320 mm.	8	340–350 mm.	3
320–330 mm.	5	350–360 mm.	2
330–340 mm.	2	360–370 mm.	0
340–350 mm.	1	370–380 mm.	1

HORIZONTAL ARC. No. 1.

The horizontal arc, taken over the glabella and opisthocranium, Table XX, varies in the male from 495-555 mm., the majority lying between 500 mm. and 530 mm. The female shows a variation between 461-532 mm., the majority lying between 480 mm. and 510 mm.

TABLE XX.

HORIZONTAL ARC OVER THE GLABELLA.

Males		Females	
Horizontal Arc	Number	Horizontal Arc	Number
490–500 mm.	2	460–470 mm.	1
500–510 mm.	11	470–480 mm.	0
510–520 mm.	12	480–490 mm.	6
520–530 mm.	8	490–500 mm.	7
530–540 mm.	3	500–510 mm.	3
540–550 mm.	3	510–520 mm.	4
550–560 mm.	2	520–530 mm.	1
		530–540 mm.	1

HORIZONTAL ARC. No. 2.

The horizontal arc over the ophryon, Table XXI, shows a variation in the male between 490-546 mm., with the majority between 490 mm. and 520 mm. In the female, the variation lies between 458-523 mm., the majority being between 480 mm. and 500 mm.

TABLE XXI.

HORIZONTAL ARC OVER THE OPHRYON.

Male		Female	
Horizontal Arc	Number	Horizontal Arc	Number
490–500 mm.	10	450–460 mm.	1
500–510 mm.	9	460–470 mm.	0
510–520 mm.	10	470–480 mm.	3
520–530 mm.	4	480–490 mm.	9
530–540 mm.	3	490–500 mm.	6
540–550 mm.	3	500–510 mm.	1
550–560 mm.	0	510–520 mm.	3
		520–530 mm.	1

OCCIPITAL FORAMEN.

The length of the occipital foramen varies, in the male, from 32-42 mm., the average being 36 mm.; in the female, from 32-40 mm., average 36.25 mm. The breadth varies, in the male, from 22-35 mm.; in the female, from 22-33 mm.; the averages being 30.72 mm. and 30.76 mm. respectively.

OCCIPITAL FORAMEN.

56 NEW ENGLAND INDIANS.

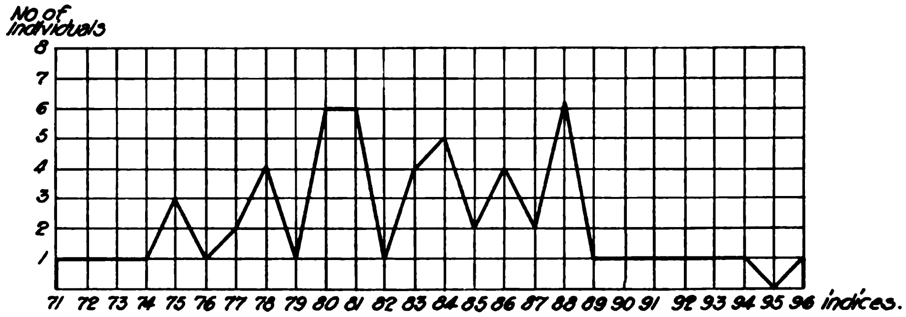


FIG. 19

From the curve in figure 19, it will be seen that the majority of the indices indicate an elliptical shape but not a very narrow one, for they more nearly approach 100 than 50 and the former indicates the index for a circle.

If it is fair to judge from so few specimens, the females have a larger number which more nearly approach the circle than the males.

MANDIBLE.

Only forty-five mandibles were available for measurement and many of these were fragmentary. The following, Tables XXII and XXIII, are the measurements taken and their ranges of variation.

TABLE XXII.

MEASUREMENTS ON THE MANDIBLE.

Males.

Measurement	Range of Variation
Condylar breadth (20)	84–138 mm.
Bi-gonial breadth (26)	80–116 mm.
Breadth of ramus (30)	29– 41 mm.
Height of ramus (25)	51– 74 mm.
Chin height (29)	31– 39 mm.

TABLE XXIII.

MEASUREMENTS ON THE MANDIBLE.

Females.

Measurement	Range of Variation
Condylar breadth (14)	102–124 mm.
Bi-gonial breadth (14)	87–104 mm.
Breadth of ramus (14)	28– 39 mm.
Height of ramus (14)	44– 66 mm.
Chin height (14)	28– 38 mm.

RELATION OF BASAL FACIAL TO BASAL CRANIAL LENGTH.

The basal facial length (ba-pr) varies, in the male, from 89 mm. to 111 mm.; in the female, from 84 mm. to 104 mm.; the basal cranial length (ba-n), in the male, from 92 mm. to 115 mm.; in the female, from 89 mm. to 129 mm. In most cases this cranial length is greater than the facial, but in the case of 18.18% of the females and 9.09% of the males the relation is reversed. In one male and one female, the two lengths are equal.

When compared with each other, these basal lengths show the degree of prognathism of the skull. If a comparison is made with the Kameruns (Drontschilow) where the prognathism is rather marked, 71.6% have the basal facial length greater than the basal cranial length. Thus, it is evident that, in the case of the New England Indians, the prognathism is slight.

CRANIAL CAPACITY.

The measurement of the cranial capacity was made, whenever the skull was complete, by the mustard seed method described by Hrdlička in Science, June 26, 1903. With the skulls which were not measured at the Peabody Museum I used a graduated tube made by Eimer and Amend instead of the one made by Ranke. The Eimer and Amend tube has been found to register 20 cc. to 22 cc. higher than the Ranke. A control skull was measured before the real one was attempted.

Of the 17 males measured, the capacity varied from 1255 cc. to 1650 cc., average, 1404.4 cc.; of the 18 females measured, the extremes ranged from 1100 cc. to 1600 cc., the average, 1287.5 cc.

TABLE XXIV.

Cranial Capacity.

New England Indians.

Males			Females		
Museum	Number	Capacity	Museum	Number	Capacity
Smith	100 c	1450 cc.	Peabody	2	1165 cc.
Park	B.	1400 cc.	"	2596	1600 cc.
Andover	41763	1370 cc.	"	2597	1360 cc.
Warren	25	1460 cc.	"	2598	1320 cc.
Peabody	43	1650 cc.	"	10.231	1225 cc.
"	10.229	1255 cc.	"	18.881	1320 cc.
"	10.246	1260 cc.	"	33.434	1510 cc.
"	11.249	1435 cc.	"	33.435	1300 cc.
"	25.299	1509 cc.	"	47.948	1155 cc.
"	47.946	1310 cc.	"	47.949	1500 cc.
"	58.796	1520 cc.	"	48.019	1270 cc.
Gilbert Coll.	1141	1260 cc.	Gilbert Coll.	1383	1170 cc.
"	1395	1380 cc.	"	2230	1290 cc.
"	1628	1415 cc.	"	2355	1270 cc.
"	1629	1400 cc.	"	2363	1300 cc.
"	2367	1300 cc.	"	2366	1100 cc.
"	2369	1440 cc.	"	2417	1280 cc.
"	2817	1280 cc.	"	2818	1240 cc.

PROJECTION MEASUREMENTS.

Whenever possible, the skull was clamped into a "Kubus Kraniophor" adjusted to the Frankfort horizontal; and a tracing of the sagittal curve made by the use of a Lissauer diagraph (made by P. Hermann, Zürich). The median points on this curve, opisthion, inion, lambda, bregma, nasion, prosthion, basion, were carefully marked by pricking the paper under the lead of the diagraph pencil at these points.

The calvarial height, the length of the perpendicular from the nasion-inion line to the highest point on the curve, varies, in the male, from 98 mm. to 115 mm.; in the female, from 101 mm. to 114 mm.

Schwalbe used at first the glabella-inion as the base upon which to erect the calvarial height but the nasion-inion is now considered more practical, as in many cases, especially in female skulls, the glabella is not noticeably projecting.

The amount of curvature of the frontal bone, which is correlated with a greater or less development of the frontal lobes of the brain, can be accurately measured by the size of the angle whose apex is on the frontal arc, at the base of the perpendicular from the frontal chord to the highest point of the arc, and whose arms pass through nasion and bregma. As the value of the angle approaches 180° the frontal arc approaches its chord, thus signifying a less development of the frontal lobes; conversely as the value of the angle approaches 90°, the size of the frontal arc increases, thus denoting a greater development of the frontal lobes and presumably a higher state of mental growth.

This frontal curvature angle varies, in the male, from 127° to 144°; in the female, from 122° to 138°. The females show on the whole a tendency toward a smaller angle than the males.

In the same way, the occipital angle shows the amount of curvature of the occipital bone and the development of the occipital lobes of the brain. (The occipital lobes include the general areas for vision.)

The occipital bone has a characteristically large protuberance in these skulls. The size of the angle varies, in the male, from 97° to 126°; in the female, from 112° to 129°.

The amount of prognathism may be determined by the comparison of the angle formed by the intersection of the lines, nasion-prosthion and basion-prosthion.

This angle (ba. pr. n.) varies, in the male, from 65° to 80°; in the female, from 70° to 86°; the majority in both sexes are very near 70°.

The value of the angle formed by the intersection of the lines opisthion-basion and prosthion-basion gives the amount of inclination of the occipital foramen, which in its turn is correlated with the relation of the head to the vertebral column. As is shown by the diagrams on Plate VII, the inclination of the occipital foramen, in the chimpanzee and in modern man, is reversed when taken in relation to the line prosthion-opisthion, while that of the prehistoric skull of La Chapelle aux Saintes is about half way between the two. As the value of the angle approaches 18° the condition is probably more nearly primitive than when the value approaches 90°. In order to make a comparison, the specimens were divided into two classes, those with an angle greater than 165°, Plate IX, and those with one less than 165°, Plate X. Of the males, 40.91% have an angle greater than 165°; of the females, 41.18%. The smallest angle of all the specimens examined (which was only 39) was that of a female and measured 138.5°, Plate VIII.

CONCLUSIONS.

As a result of these measurements, I can state that a typical cranium of the Southern New England Indian might have the following measurements since these are the average measurements of male and female taken separately.

TABLE XXV.

TABLE OF AVERAGE MEASUREMENTS.

	Male	Female
Name of Measurement	Average measurements	Average measurements
Greatest length	182.2 mm.	175.5 mm.
Glabella-inion length	175.5 mm.	164.4 mm.
Nasion-inion length	171.0 mm.	160.3 mm.
Frontal arc	126.2 mm.	123.0 mm.
Parietal arc	122.7 mm.	119.4 mm.
Occipital arc	118.8 mm.	113.3 mm.
Frontal chord	113.6 mm.	108.8 mm.
Parietal chord	109.6 mm.	107.2 mm.
Occipital chord	97.8 mm.	96.8 mm.
Total facial length	113.58 mm.	111.9 mm.
Superior facial length	69.2 mm.	67.3 mm.
Orbital height	33.83 mm.	33.7 mm.
Nasal height	50.35 mm.	49.40 mm.
Chin height	34.1 mm.	32.5 mm.
Least frontal breadth	93.2 mm.	90.0 mm.
Inter-frontomalare temporale	98.0 mm.	93.0 mm.
Inter-frontomalare orbitale	98.05 mm.	93.0 mm.

	Male	Female
Name of Measurement	Average measurements	Average measurements
Inter-zygomaxillare	105.9 mm.	99.3 mm.
Inter-lacrimale	23.6 mm.	22.8 mm.
Orbital breadth from maxillo-frontale	42.52 mm.	41.5 mm.
Nasal breadth	25.77 mm.	25.3 mm.
Zygomatic breadth	132.0 mm.	127.6 mm.
Auricular breadth	123.2 mm.	120.3 mm.
Inter-coronal breadth	119.1 mm.	111.3 mm.
Greatest cranial breadth	134.0 mm.	132.0 mm.
Horizontal circumference over glabella	518.1 mm.	497.0 mm.
" " " ophryon	511.1 mm.	492.5 mm.
Transverse circumference	324.6 mm.	312.6 mm.
Basal cranial length	105.7 mm.	102.7 mm.
Cranial height	136.1 mm.	133.2 mm.
Basal facial length	102.3 mm.	97.3 mm.
Basion-gnathion	114.1 mm.	110.5 mm.
Basion-opisthion	36.0 mm.	36.5 mm.
Breadth of occipital foramen	30.7 mm.	30.76 mm.
Total sagittal arc	368.7 mm.	357.0 mm.
Inter-asterial breadth	107.8 mm.	107.1 mm.
Inter-mastoid breadth	105.5 mm.	99.4 mm.
Maxillo-alveolar length	53.36 mm.	51.8 mm.
" breadth	61.39 mm.	69.62 mm.
Palatal length	46.11 mm.	45.5 mm.
" breadth	36.5 mm.	38.0 mm.
Auricular height	115.4 mm.	113.5 mm.
Condylar breadth	115.5 mm.	113.2 mm.
Inter-gonial	93.5 mm.	98.0 mm.
Height of ramus	58.7 mm.	55.0 mm.
Breadth of ramus	35.5 mm.	33.8 mm.

	Male	Female
Name of Index	Average Indices	Average Indices
Length-breadth	73.63	75.43
Length-height	74.73	75.9
Breadth-height	101.49	100.76
Auricular length-height	63.19	65.14
Transverse frontal	78.15	81.08
Transverse frontal-parietal	69.40	68.18
Sagittal fronto-parietal	97.62	96.75
Sagittal frontal	90.48	88.62
Sagittal parietal	89.43	89.92
Sagittal occipital	82.35	85.84
Total facial	85.61	87.50
Superior facial	52.27	52.34
Nasal	52.0	51.02
Orbital	80.95	80.49
Inter-orbital	23.47	24.70
Maxillo-alveolar	115.09	134.62
Palatal	78.26	84.44
Cranio-facial	98.51	96.97
Fronto-biorbital	94.90	96.77
Fronto-malar	70.45	70.31
Malar-mandibular	70.45	76.56
Fronto-parietal chord	95.61	98.17

The hypothetical typical male is, then, dolicho-, orthocephalic, mesoprosopic, chamaerrhine, mesoconch, leptostaphyline. The female is meso-, hypsicephalic, mesoprosopic, chamaerrhine, mesoconch, mesostaphyline.

Smith College Anthropological Laboratory.
May 15, 1914.

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APPENDIX A.

DESCRIPTION OF MEASUREMENTS.

The measurements for this work were taken according to the prescriptions of the International Conference at Monaco in 1906. Those not described in that report were used according to the directions of Prof. Otto Schlaginhaufen, Zürich, and Prof. Eugen Fischer, Freiburg.

The instruments used are the craniometer, goniometer, and slide-compass made by the firm P. Herman, Zürich.

1. g-oe. Greatest cranial length: this is measured from the most projecting part of the glabella to the most protruding point of the occipital bone, in a median plane. Craniometer.

2. g-i. Glabella-inion length: the distance between the most prominent part of the glabella and the inion, the point of junction of the superior curved lines; or, if these are too indistinct, the external point corresponding to the point of the internal occipital protuberance [Broca]. Craniometer.

3. n-i. Nasion-inion length: the distance from the nasion to the inion. Craniometer.

4. arc n-b. Frontal arc: the curve of the frontal bone from the nasion to the bregma. Measuring tape.

5. arc g-i. Glabella-inion arc: the curve from glabella to inion. Measuring tape.

6. arc b-l. Parietal arc: the curve of the parietal bone from the bregma to the lambda. Measuring tape.

7. n-b. Frontal chord: the distance between the nasion and the bregma. Slide-compass.

8. b-l. Parietal chord: the distance between bregma and lambda. Slide-compass.

9. n-gn. Total facial length: the distance from nasion to gnathion, the median and most downwardly projecting point on the lower rim of the mandible. Slide-compass.

10. n-pr. Superior facial length: the distance from nasion to prosthion, the most projecting median point on the alveolar border of the upper jaw, generally between the two middle incisors. Slide-compass.

11. orb. ht. Orbital height: the distance from the middle point of the lower orbital rim, perpendicular to the orbital breadth, to the upper rim. Slide-compass.

12. n-ns. Nasal height: the distance from nasion to naso-spinale, i. e., the intersection of the median sagittal plane and the line tangent to the deepest points of the piriform aperture. Slide-compass.

13. id-gn. Chin height: the distance between the infradentale, the most projecting median point of the alveolar border of the mandible between the two middle incisors, and the gnathion. Slide-compass.

14. ft-ft. Least frontal breadth: the least breadth between the temporal lines on the frontal bone, the terminal points being the fronto-temporalia. Slide-compass.

15. fmt-fmt. Outer orbito-facial breadth: the distance between the most lateral lying point on the zygomatico-frontal suture [frontomalare-temporale] on one side, to the corresponding point on the other side. Slide-compass.

16. fmo-fmo. Inner orbito-facial breadth: the distance between the point on the orbital rim where the zygomatico-frontal suture cuts it [frontomalare-orbitale] on one side to the corresponding point on the other side. Slide-compass.

17. zm-zm. Breadth of upper jaw: the distance between the two zygomatico-maxillaria, the lowest points on the zygomatico-maxillary sutures.

18. la-la. Posterior interorbital breadth: the breadth between the two lacrimalia. This latter is the point where the posterior rim of the lacrimal groove meets the frontal-lacrimal suture. Slide-compass.

19. mf-mf. Anterior interorbital breadth: the distance between the two maxillofrontalia, the points on the inner rims cut by the fronto-maxillary sutures. Slide-compass.

20. mf-ek. Orbital breadth from the maxillofrontale: the distance from the maxillofrontale, parallel to the direction of the upper and lower rim, and extending to the outermost point of the orbit, the ectoconchion. Slide-compass.

21. d-ek. Orbital breadth from the dacryon: the distance from the dacryon, the point where frontal, maxillary, and lacrimal bones meet, to the ectoconchion as in the above. Slide-compass.

22. la-ek. Orbital breadth from the lacrimale: the distance from the lacrimale to ectoconchion as in the above. Slide-compass.

23. na.br. Nasal breadth: the greatest breadth of the piriform aperture. Slide-compass.

24. zy-zy. Zygomatic breadth: the greatest breadth between the two most lateral points on the zygomatic arches. The arms of the craniometer are applied to each arch and then moved back and forth until the greatest breadth is registered. Craniometer.

25. au-au. Biauricular breadth: the distance from the point on the zygomatic arch directly above the auditory meatus, on one side to the corresponding point on the other side. Craniometer.

26. co-co. Greatest frontal breadth: the distance from the most lateral point on the coronal suture [coronale] to the corresponding point on the opposite side. Craniometer.

27. eu-eu. Greatest cranial breadth: the greatest breadth perpendicular to the median sagittal plane but not above the temporal lines of the parietal bones. Craniometer.

28. circ(g). Horizontal arc over the glabella: the circumference over the most prominent part of the glabella and the most projecting part of the posterior portion of the cranium. Measuring tape.

29. circ(on). Horizontal circumference over the ophryon: the circumference over the ophryon, the point of intersection of the least frontal breadth line and the median sagittal plane, and the opisthocranium as in the above. Measuring tape.

30. circ(po-po). Transverse arc: the arc from the porion, the point on the rim of the auditory meatus directly above its center, over the bregma to the corresponding,point on the opposite side. Measuring tape.

31. n-ba. Basal facial length: the distance from nasion to basion, the middle point on the anterior rim of the occipital foramen. Craniometer.

32. ba-b. Cranial height: the distance from basion to bregma. Craniometer.

33. cran. ht. Total cranial height: the distance from basion to the highest point on the skull in a plane perpendicular to the Frankfort horizontal and passing through the basion. Goniometer.

34. ba-pr. Facial length: from basion to prosthion. Craniometer.

35. ba-gn. Basion-gnathion length: from basion to gnathion. Craniometer.

36. ba-o. Length of the occipital foramen: the distance from basion to opisthion. Slide-compass.

37. max. br. Breadth of occipital foramen: the maximum breadth of the occipital foramen, perpendicular to the length line. Slide-compass.

38. l-o. Occipital chord: the distance between the points lambda and opisthion. Slide-compass.

39. arc l-o. Occipital arc: the arc from lambda to opisthion. Measuring tape.

40. arc n-o. Total sagittal arc: the circumference from nasion to opisthion. Measuring tape.

41. ast-ast. Occipital breadth: the distance between the two points at the junction of the three sutures, parieto-mastoid, parieto-occipital, and occipito-mastoid, on each side of the occipital bone, asterion. Slide-compass.

42. ms-ms. Mastoid breadth: the distance between the points of the two mastoids. Slide-compass.

43. mx. alv. lg. Maxillo-alveolar length: the distance from the most anterior point of the alveolar border, between the two middle incisors, to the median point of the line tangent to the most posterior extremity of the alveolar border, which may be obtained by placing a fine knitting needle in the grooves between the border and the lateral plate of the pterygoid process. Slide-compass.

44. mx. alv. br. Maxillo-alveolar breadth: the distance between the outer alveolar borders which spans the greatest distance. Slide-compass.

45. pal. lg. Palatal length: the distance between the median point of the line tangent to the inner alveolar border of the two middle incisors and the median point of the line tangent to the two indentations in the posterior border of the palate. Slide-compass.

46. pal. br. Palatal breadth: the distance from the inner alveolar border of the second molar to the corresponding point on the opposite side. Slide-compass.

47. aur. ht. Auricular height: the perpendicular distance between two planes parallel to the Frankfort Horizontal; one, passing through the poria, the other, tangent to the top of the cranium at the median point located by the intersection of the sagittal curve and a plane perpendicular to the Frankfort Horizontal and passing through the poria.

48. go-go. Bigonial breadth: the distance between the gonion, the point on the angle of the lower jaw which is directed most downwards, outwards, and backwards, on one side to the corresponding point on the other side. Slide-compass.

49. ht. ramus. Height of ramus: from gonion to top of condyle. Slide-compass.

50. condylar br. of mand. Condylar breadth of mandible: the distance between the two outermost points on the condyles. Slide-compass.

51. br. ramus. Breadth of ramus: the least breadth of the ramus between the anterior and posterior borders. Slide-compass.

52. ang. n. pr. Total profile angle: the angle which the nasion-prosthion line makes with the Frankfort Horizontal line. Goniometer.

53. ang. n. ss. Nasal profile angle: the angle made by the Frankfort Horizontal and the line between nasion and subspinale. This latter point is the median point where the lower anterior border of the anterior nasal spine runs into the alveolar process. Goniometer.

54. ang. ss. pr. Alveolar profile angle: the angle formed by the line between the subspinale and prosthion and the Frankfort Horizontal. Goniometer.

55. arc pars cereb. Arc of the pars cerebralis: the portion of the frontal arc from ophryon to bregma. Measuring tape.

56. arc pars(g). Arc of the pars glabellaris: the portion of the frontal arc from nasion to ophryon. Measuring tape.

57. cran. cap. Cranial capacity: the number of cubic centimeters in the cranial cavity, measured by the use of mustard seed, as described by Hrdlicka in Science, June 26, 1903. In measuring the skulls which were not from the Peabody Museum a graduated tube made by Eimer and Amend was used instead of the Ranke tube. It has been found that the graduated cylinder made by Eimer and Amend registers 20 cc. to 22 cc. higher than the Ranke. A control skull was measured each time before attempting the specimen.

APPENDIX B.

GEOGRAPHICAL DISTRIBUTION OF CRANIA.

I. Connecticut River Valley.

a. *Massachusetts.*

Peabody	32560	Longmeadow
"	32563	"
"	32564	"
"	32565	"
"	37924	"
Amherst	2230	Easthampton
"	2363	"
"	2365	"
"	2366	"
"	2367	"
"	2817	Hadley
"	2818	"
"	2917	"
Smith	105 a	"
"	158	"
"	102	North Hadley
"	100 c	"
Amherst	1395	"
Smith	104	Hatfield
"	123	"
Amherst	1383	Deerfield
"	1630	"
"	2369	"
"	2356	Turners Falls
"	2355	Springfield
Holyoke		Smiths Ferry

b. *Connecticut.*

Amherst	1628	Farmington
"	1628	"

II. Massachusetts; Seaboard.

Peabody	43	Newburyport
"	10.237	Marblehead
"	10.246	"
"	10.266	Salem
"	10.249	"
"	10.250	"
"	24.851	"
"	10.229	Saugus
"	10.230	"
"	10.231	"
"	18.881	Beverley
"	57.384	"
"	660	"
Andover	36092	Ipswich
Peabody	11.249	West Andover
"	48.008	"
Andover	38897	Lawrence
"	38937	Brighton
Peabody	45.647	Winthrop
"	45.648	"
"	45.649	"
Peabody	15.378	Revere
"	25.299	"
"	58.796	Cambridge
"	47.948	West Newton
"	47.949	"
Amherst	2417	Swansea
Peabody	18.225	Swampscott
"	2	Hingham
"	37.920	Plymouth
"	37.921	"
"	33.431	Marion
"	33.434	"
"	33.435	"
"	26.132	Kingston
"	26.133	"

III. Massachusetts; Inland
(*not Connecticut River Valley*).

Peabody	47.951	Wayland
"	57.385	Winchendon

IV. Rhode Island, East of Narragansett Bay.
(*Wampanoag.*)

Peabody	15.306	Cumberland
"	15.307	"
"	15.308	"
"	25.96	Tiverton
"	25.97	"
"	25.98	"
Park Museum	E 1019	"
"	E 908	Warren
"	E 909	"
"	E 910	"
Warren	25	"
Charles Carr	11a	"
"	11b	"
"	11c	"
"	11d	"
"	11e-f	"

V. Rhode Island, West of Narragansett Bay.
(*Narragansett, Niantic.*)

Peabody	41.763	Jamestown
"	24.77	Westerly
Park Museum	A	No data
"	B	"

VI. Massachusetts.

No other data.

Peabody	15.310
"	48.019
"	10.271
"	10.272
"	57.383

APPENDIX C.

GENERAL DESCRIPTION OF CRANIA.

Gilbert Collection, Amherst College.

1141, male; length-breadth index 77.84, dolicho-, hypsicephalic, mesoprosopic, chamaerrhine, mesoconch, leptostaphyline.

1383, female; length-breadth index 80.24, brachycephalic, hypsicephalic, chamaeprosopic, hyperchamaerrhine, mesoconch, brachystaphyline.

1395, male; length-breadth index 74.32, dolicho-, hypsicephalic, chamaerrhine, mesoconch, brachystaphyline.

1628, male; length-breadth index 74.74, dolicho-, orthocephalic, mesoprosopic, mesorrhine, mesoconch, brachystaphyline.

1629, male; length-breadth index 72.73, dolicho-, orthocephalic, mesoprosopic, mesorrhine, mesoconch, mesostaphyline.

1630, male; length-breadth index 77.05, meso-, orthocephalic, hyperchamaeprosopic, mesorrhine, hypsiconch, —.

2230, female; length-breadth index 69.15, hyperdolicho-, chamaecephalic, —, —, —, —.

2355, female; length-breadth index 74.32, dolicho-, chamaecephalic, —, chamaerrhine, hypsiconch, brachystaphyline.

2356, male; length-breadth index 73.89, dolicho-, hypsicephalic, mesoprosopic, chamaerrhine, mesoconch, brachystaphyline.

2363, female; length-breadth index 74.16, dolicho-, chamaecephalic, —, —, —, —.

2365, male; length-breadth index —, orthocephalic, —, hyperchamaerrhine, hypsiconch, leptostaphyline.

2366, female; length-breadth index 83.54, brachy-, hypsicephalic, mesoprosopic, mesorrhine, hypsiconch, leptostaphyline.

2367, male; length-breadth index 80.11, brachy-, hypsicephalic, —, mesorrhine, hypsiconch, brachystaphyline.

2369, male; length-breadth index 73.94, dolicho-, orthocephalic, mesoprosopic, hyperchamaerrhine, mesoconch, mesostaphyline.

2417, female; length-breadth index 76.97, meso-, hypsicephalic, mesoprosopic, hyperchamaerrhine, hypsiconch, brachystaphyline.

2818, female; length-breadth index 73.03, dolicho-, orthocephalic, mesoprosopic, chamaerrhine, mesoconch, mesostaphyline.

2946, male; length-breadth index 67.68, hyperdolicho-, chamaecephalic, —, chamaerrhine, mesoconch, brachystaphyline.

Peabody Museum, Cambridge.

2, female; length-breadth index 72.99, dolicho-, orthocephalic, leptoprosopic, mesorrhine, hypsiconch, leptostaphyline.

43, male; length-breadth index 73.98, dolicho-, orthocephalic, —, mesorrhine, mesoconch, brachystaphyline.

660, female; lengh-breadth index 67.02, hyperdolicho-, chamaecephalic, mesoprosopic, leptorrhine, mesoconch, leptostaphyline.

24.77, male; —, —, —, hyperchamaeprosopic, mesorrhine, mesoconch, brachystaphyline.

25.96, female; length-breadth index 78.77, meso-, hypsicephalic, chamaeprosopic, chamaerrhine, mesoconch, mesostaphyline.

25.97, female; length-breadth index 78.95, meso-, hypsicephalic, mesoprosopic, mesorrhine, hypsiconch, brachystaphyline.

25.98, female; length-breadth index 77.33, meso-, hypsicephalic, leptoprosopic, mesorrhine, hypsiconch, mesostaphyline.

10.229, male; length-breadth index 71.21, dolicho-, hypsicephalic, mesoprosopic, chamaerrhine, mesoconch, mesostaphyline.

10.230, male; length-breadth index 73.26, dolicho-, orthocephalic, mesoprosopic, mesorrhine, mesoconch, leptostaphyline.

10.231, female; length-breadth index 77.19, meso-, hypsicephalic, leptoprosopic, leptorrhine, hypsiconch, leptostaphyline.

10.237, male; length-breadth index 72.43, —, —, —, —, —, —.

10.246, male; length-breadth index 77.22, meso-, orthocephalic, hyperchamaeprosopic, chamaerrhine, mesoconch, brachystaphyline.

10.249, male; length-breadth index 69.23, hyperdolicho-, orthocephalic, leptoprosopic, mesorrhine, mesoconch, leptostaphyline.

10.250 (posterior part of cranium).
10.266, female (frontal bone).
10.271, female (frontal bone).
10.272, female (fragments).
11.249, male; length-breadth index 70.74, dolicho-, orthocephalic, mesoprosopic, mesorrhine, chamaeconch, mesostaphyline.
15.306, male; length-breadth index 80.32, brachy-, chamaecephalic, mesoprosopic, leptorrhine, mesoconch, brachystaphyline.
15.307, male; length-breadth index 75, meso-, hypsicephalic, chamaeprosopic, chamaerrhine, mesoconch, brachystaphyline.
15.308, male; length-breadth index 74.44, dolicho-, orthocephalic, mesoprosopic, chamaerrhine, mesoconch, leptostaphyline.
15.310, male; length-breadth index 76.54, meso-, orthocephalic, leptoprosopic, leptorrhine, mesoconch, leptostaphyline.
15.378, female; length-breadth index 72.63 dolicho-, hypsicephalic, mesoprosopic, mesorrhine, mesoconch, brachystaphyline.
18.225, male; length-breadth index 69.23, hyperdolicho-, orthocephalic, mesoprosopic, mesorrhine, hypsiconch, mesostaphyline.
18.881, female; length-breadth index 71.67, dolicho-, orthocephalic, mesoprosopic, leptorrhine, mesoconch, mesostaphyline.
24.851, male; length-breadth index 69.23, hyperdolicho-, chamaecephalic, —, —, —, —.
25.299, male; length-breadth index 73.30, dolicho-, orthocephalic, mesoprosopic, mesorrhine, mesoconch, brachystaphyline.
26.132, male; length-breadth index 78.89, meso-, hypsicephalic, mesoprosopic, mesorrhine, mesoconch, mesostaphyline.
26.133, female; length-breadth index 84.24, brachycephalic, —, chamaeprosopic, chamaerrhine, hypsiconch, mesostaphyline.
32.560, male (fragments).
32.563, male; length-breadth index 72.11, dolichocephalic, —, —, —, —, —.
32.564, male; length-breadth index 75.82, mesocephalic, —, —, —, —, —.
32.565, male; length-breadth index 74.87, dolichocephalic, —, —, —, —, —.
33.431, female (fragments).
33.434, female; length-breadth index 74.05, dolicho-, hypsicephalic, leptoprosopic, chamaerrhine, mesoconch, leptostaphyline.
33.435, female; length-breadth index 78.61, meso-, hypsicephalic, mesoprosopic, mesorrhine, mesoconch, brachystaphyline.
37.920 (fragments).
37.921 (fragments).
37.924, female; length-breadth index 76.47, meso-, orthocephalic, —, —, —, —.
38.937, female; length-breadth index 71.26, dolicho-, orthocephalic, —, chamaerrhine, hypsiconch, brachystaphyline.
45.647, male; length-breadth index 63.49, hyperdolicho-, orthocephalic, hyperleptoprosopic, mesorrhine, chamaeconch, leptostaphyline.
45.648, male; length-breadth index 71.82, dolichocephalic, chamaeprosopic, mesorrhine, mesoconch, mesostaphyline.
45.649, male; length-breadth index 77.53, meso-, hypsicephalic, —, —, —, —.
47.946, male; length-breadth index 81.50, brachy-, hypsicephalic, leptoprosopic, leptorrhine, mesoconch, mesostaphyline.
47.948, female; length-breadth index 79.04, meso-, hypsicephalic, —, —, —, —.
47.949, female; length-breadth index 79.67, meso-, orthocephalic, hyperchamaeprosopic, chamaerrhine, chamaeconch, brachystaphyline.
47.951, female (fragments).
48.008, male (fragments).
48.019, female; length-breadth index 75.88, meso-, hypsicephalic, leptoprosopic, chamaerrhine, hypsiconch, leptostaphyline.
57.383, male; length-breadth index 75.96, mesocephalic, —, —, —, —, —.
57.384, male; length-breadth index 75.15, mesocephalic, hypsicephalic, —, —, —, —.
57.385, female (fragments).
58.796, male; length-breadth index 73.80, dolicho-, orthocephalic, mesoprosopic, leptorrhine, mesoconch, mesostaphyline.

SMITH COLLEGE COLLECTION.

100 c, male; length-breadth index 73.22, dolicho-, orthocephalic, chamaeprosopic, chamaerrhine, chamaeconch, brachystaphyline.

104, male; length-breadth index 74.46, dolichocephalic, —, —, —, —.

105, male; length-breadth index 75.82, meso-, orthocephalic, mesoprosopic, chamaerrhine, mesoconch, brachystaphyline.

123, female (fragments).

158, male; length-breadth index 73.80, dolicho-, orthocephalic, —, —, —, —.

PARK MUSEUM, PROVIDENCE.

A, female; length-breadth index 75.84, meso-, hypsicephalic, chamaeprosopic, mesorrhine, mesoconch, brachystaphyline.

B, male; length-breadth index 79.21, meso-, hypsicephalic, leptoprosopic, mesorrhine, chamaeconch, brachystaphyline.

E 908, male; length-breadth index 74.30, dolicho-, hypsicephalic, chamaeprosopic, mesorrhine, leptostaphyline.

E 909, male; length-breadth index 69.68, hyperdolicho-, orthocephalic, hyperleptoprosopic, chamaerrhine, mesoconch, leptostaphyline.

E 910, female; length-breadth index 81.55, brachy-, hypsicephalic, mesoprosopic, chamaerrhine, hypsiconch, leptostaphyline.

E 1019, female; length-breadth index 73.99, dolichocephalic, hypsicephalic, —, mesorrhine, hypsiconch, leptostaphyline.

PHILLIPS ACADEMY COLLECTION, ANDOVER.

36092, female; length-breadth index 70.2, dolicho-, orthocephalic, —, —, —.

38897, male?; length-breadth index 69.8, hyperdolichocephalic, hypsicephalic, —, —, —, —.

41763, male; length-breadth index 68.3, hyperdolicho-, orthocephalic, —, —, —, —.

HOLYOKE PUBLIC LIBRARY.

—, male; length-breadth index 68.51, hyperdolichocephalic, —, mesoprosopic, mesorrhine, mesoconch, brachystaphyline.

WARREN, R. I.

25, male; length-breadth index 75.54, meso-, hypsicephalic, chamaeprosopic, chamaerrhine, chamaeconch, brachystaphyline.

11a, ?; length-breadth index 72.88 (fragments).

11b, ?; length-breadth index 75.66 (fragments).

11c, male; length-breadth index 73.9 (fragments).

11d, e, f (fragments).

Plate I.

GILBERT COLLECTION, AMHERST COLLEGE. 1395.

Length-Breadth Index 74.32.

This is a male skull obtained by C. M. Lamson from North Hadley in 1863. The preservation is not very good on the left side due to the fact that locally the Indians were buried lying on the right side, thus leaving the left exposed. The teeth have fallen out since death.

The following are the measurements of this skull:

Greatest length	183	mm.
Glabella-inion	177	mm.
Nasion-inion	173	mm.
Frontal arc	128	mm.
" chord	114	mm.
Parietal arc	122	mm.
" chord	109	mm.
Occipital arc	115	mm.
" chord	96	mm.
Total sagittal arc	362	mm.
Nasion-gnathion	116	mm.
Nasion-prosthion	72	mm.
Orbital height	32.5	mm.
Nasion-nasospinale	46	mm.
Chin height	37	mm.
Least frontal breadth	90.5	mm.
Inter-frontomalare temporale	113	mm.
Inter-frontomalare orbitale	103	mm.
Inter-zygomaxillare	—	mm.
Inter-lacrimal	22.5	mm.
Inter-maxillofrontal	20	mm.
Orbital breadth from the maxillofrontal	42	mm.
Orbital breadth from the dacryon	41	mm.
Orbital breadth from the lacrimale	39	mm.
Nasal breadth	26	mm.

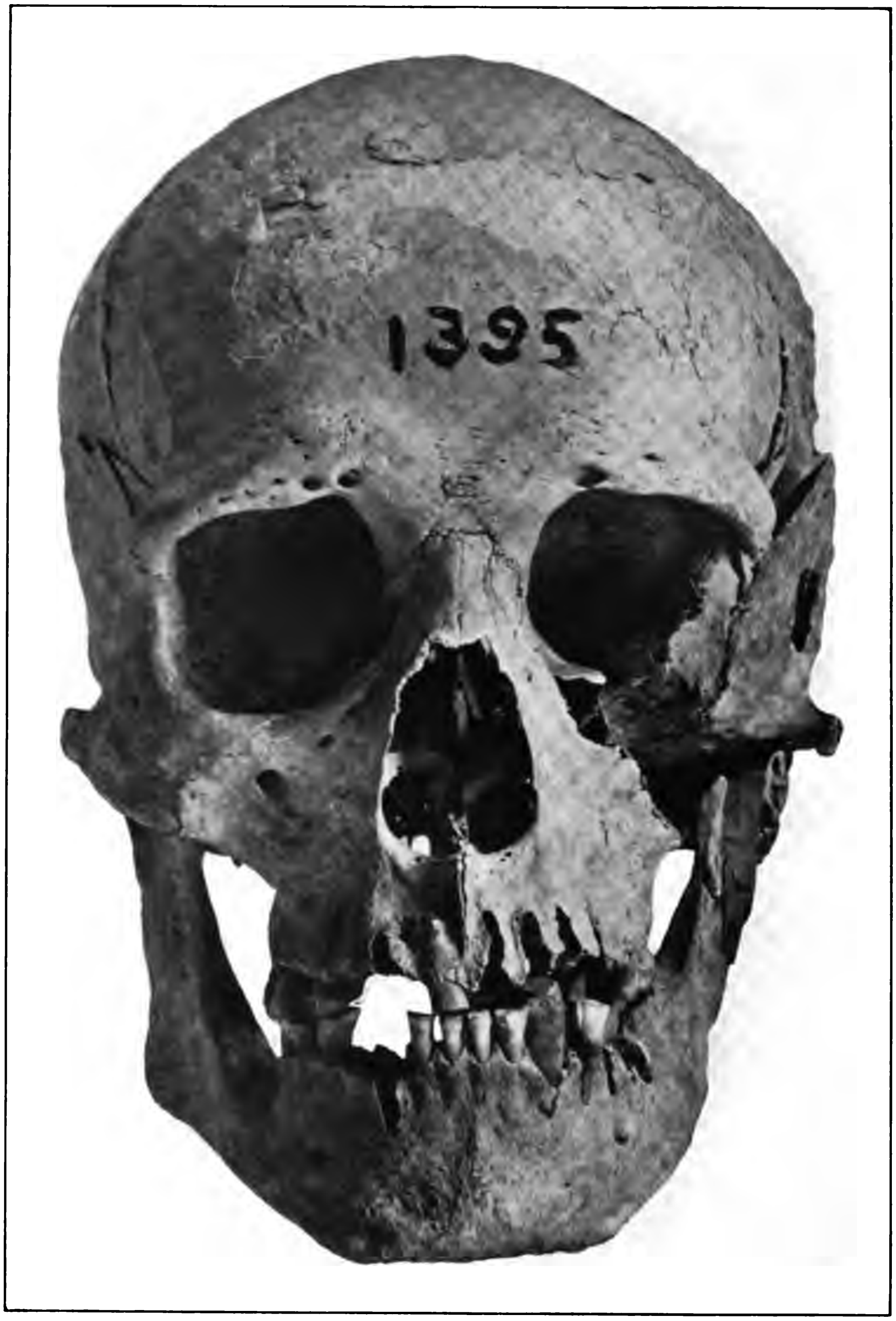
Zygomatic breadth	—	mm.
Auricular breadth	124	mm.
Intercoronal breadth	114	mm.
Greatest cranial breadth	136	mm.
Horizontal circumference over the glabella	515	mm.
Horizontal circumference over the ophryon	510	mm.
Transverse circumference	310?	mm.
Nasion-basion	105	mm.
Basion-bregma	142	mm.
Cranial height	143	mm.
Basion-prosthion	98	mm.
Basion-gnathion	111	mm.
Basion-opisthion	37	mm.
Breadth of foramen	29	mm.
Bi-asterial breadth	106	mm.
Bi-mastoid breadth	101.5	mm.
Maxillo-alveolar length	52	mm.
" " breadth	62	mm.
Palatal length	43	mm.
" breadth	41	mm.
Auricular height	115	mm.
Condylar breadth	—	mm.
Bi-gonial	96	mm.
Height of ramus	56	mm.
Breadth of ramus	31	mm.
Cranial capacity	1380	cc.

The following are the indices derived from these measurements:

Length-breadth	74.32	Superior facial	—
Length-height	77.60	Nasal	52.17
Breadth-height	104.31	Orbital	77.38
Auricular length-height	66.12	Inter-orbital	22.33
Calvarial height	58.96	Maxillo-alveolar	119.23
Transverse frontal	77.82	Palatal	95.35
Transverse fronto-parietal	66.91	Cranio-facial	—
Sagittal fronto-parietal	95.31	Fronto-biorbital	80.53
" frontal	89.06	Fronto-malar	—
" parietal	89.36	Malar-mandibular	—
" occipital	83.48	Fronto-parietal chord	95.61
Total facial	—		

General Description of Skull.

Male, circ. 35 yrs., dolicho-, chamaecephalic, chamaerrhine, chamaeconch, brachystaphyline.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Plates II and III.

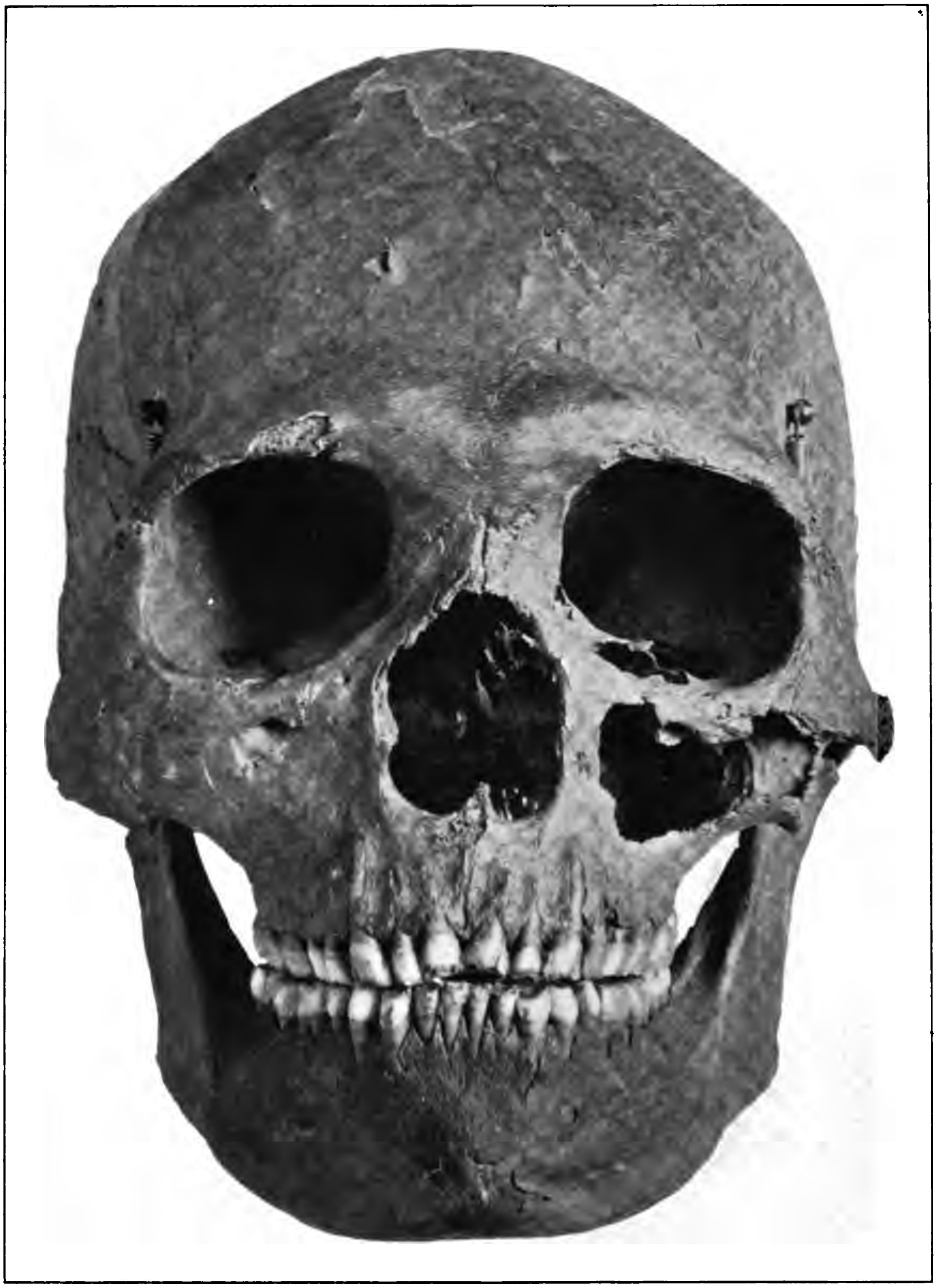
SMITH COLLEGE COLLECTION. 100 c.

Length-breadth Index 73.22.

This is the skull of a young man found in L. P. Bullard's tobacco field, North Hadley, Mass., in October, 1904. H. H. Wilder published an account of this excavation in The American Anthropologist (N. S.), Vol. VII, No. 2, 1905. The preservation is good; all the teeth are present, but there is a hole in the left maxillary and malar bone and the right zygomatic arch is broken.

The following are the measurements of this cranium:

Greatest length	183	mm.
Glabella-inion length	172	mm.
Nasion-inion length	168	mm.
Frontal arc	119	mm.
" chord	109	mm.
Parietal arc	120	mm.
" chord	109	mm.
Occipital arc	119	mm.
" chord	96	mm.
Total sagittal arc	356	mm.
Nasion-gnathion	110	mm.
Nasion-prosthion	64	mm.
Orbital height	34	mm.
Nasion-nasospinale	47	mm.
Chin height	34	mm.
Least frontal breadth	89	mm.
Inter-frontomalare temporale	110	mm.
Inter-frontomalare orbitale	103	mm.
Inter-zygomaxillare	106	mm.
Inter-lacrimal	26	mm.
Inter-maxillofrontal	25	mm.
Orbital breadth from the maxillofrontal	45	mm.
Orbital breadth from the dacryon	41	mm.
Orbital breadth from the lacrimale	38	mm.
Nasal breadth	26	mm.
Zygomatic breadth	137+	mm.
Auricular breadth	130	mm.
Intercoronal breadth	110	mm.
Greatest cranial breadth	134	mm.
Horizontal circumference over the glabella	515	mm.
Horizontal circumference over the ophryon	510	mm.
Transverse circumference	306	mm.
Nasion-basion	103	mm.
Basion-bregma	129	mm.
Cranial height	132	mm.
Basion prosthion	98	mm.
Basion-gnathion	114	mm.
Basion-opisthion	39	mm.
Breadth of foramen	29	mm.
Bi-asterial breadth	109	mm.
Bi-mastoid breadth	105	mm.
Maxillo-alveolar length	51	mm.
Maxillo-alveolar breadth	60	mm.
Palatal length	50	mm.
Palatal breadth	45	mm.
Auricular height	116	mm.
Condylar breadth	124?	mm.
Bi-gonial breadth	98	mm.
Height of ramus	55	mm.
Breadth of ramus	34	mm.
Cranial capacity	1450.5	cc.



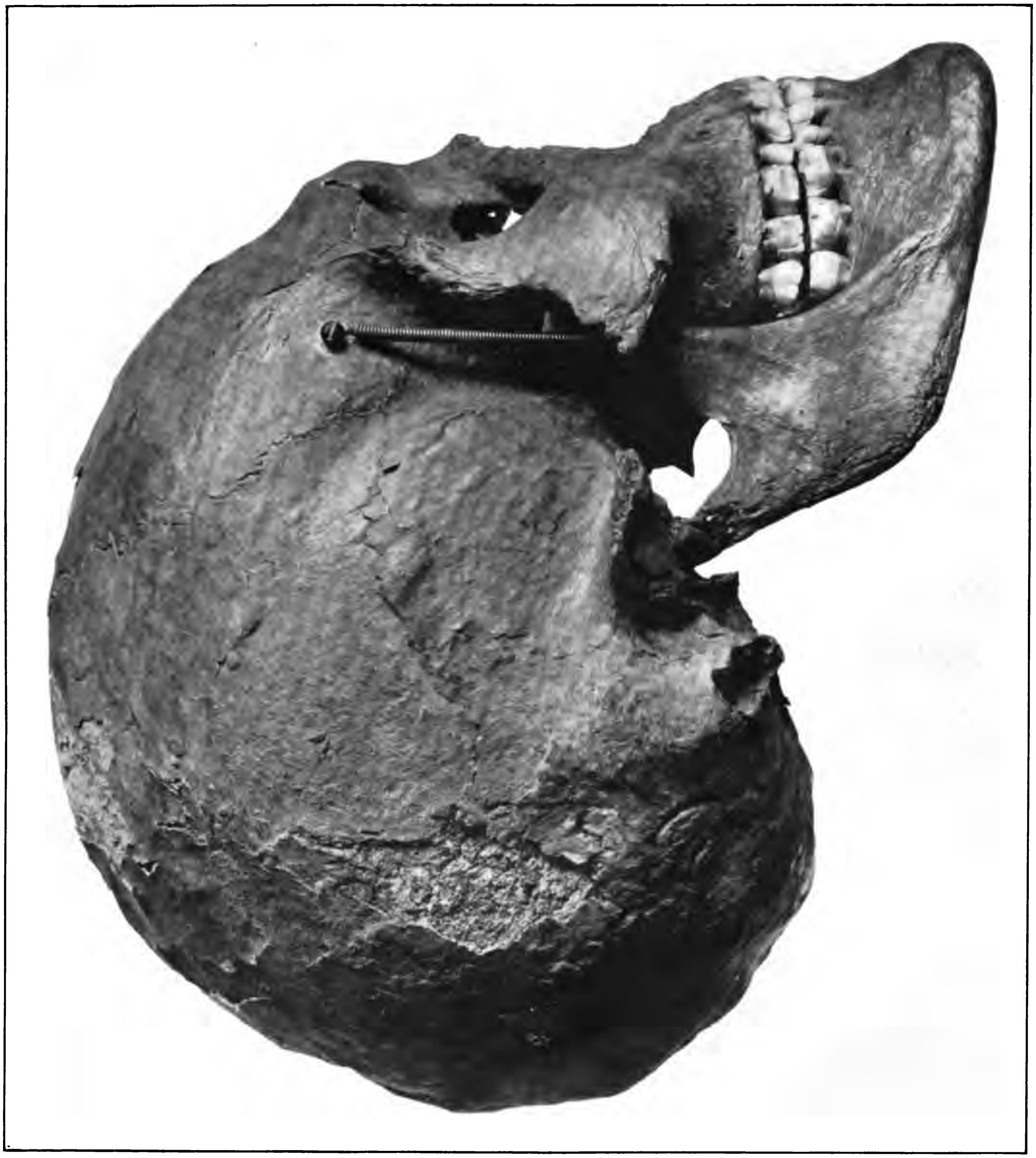
Plates II and III.

The following are the indices derived from these measurements:

Length-breadth index	73.22	Total facial	80.29
Length-height "	70.49	Superior facial	46.71
Breadth-height "	96.27	Nasal	55.32
Auricular length-height	63.39	Orbital	75.56
Calvarial height	63.69	Inter-orbital	25.24
Transverse frontal	78.76	Maxillo-alveolar	117.65
Transverse fronto-parietal	66.42	Palatal	90.0
Sagittal fronto-parietal	100.84	Cranio-facial	102.24
" frontal	91.60	Fronto-biorbital	80.91
" parietal	89.17	Fronto-malar	64.96
" occipital	80.67	Malar-mandibular	71.83

General Description of Skull.

Male, circ. 25 yrs., dolicho-, hypsicephalic, chamaeprosopic, chamaeconch, chamaerrhine, brachystaphyline.



Plates IV and V.

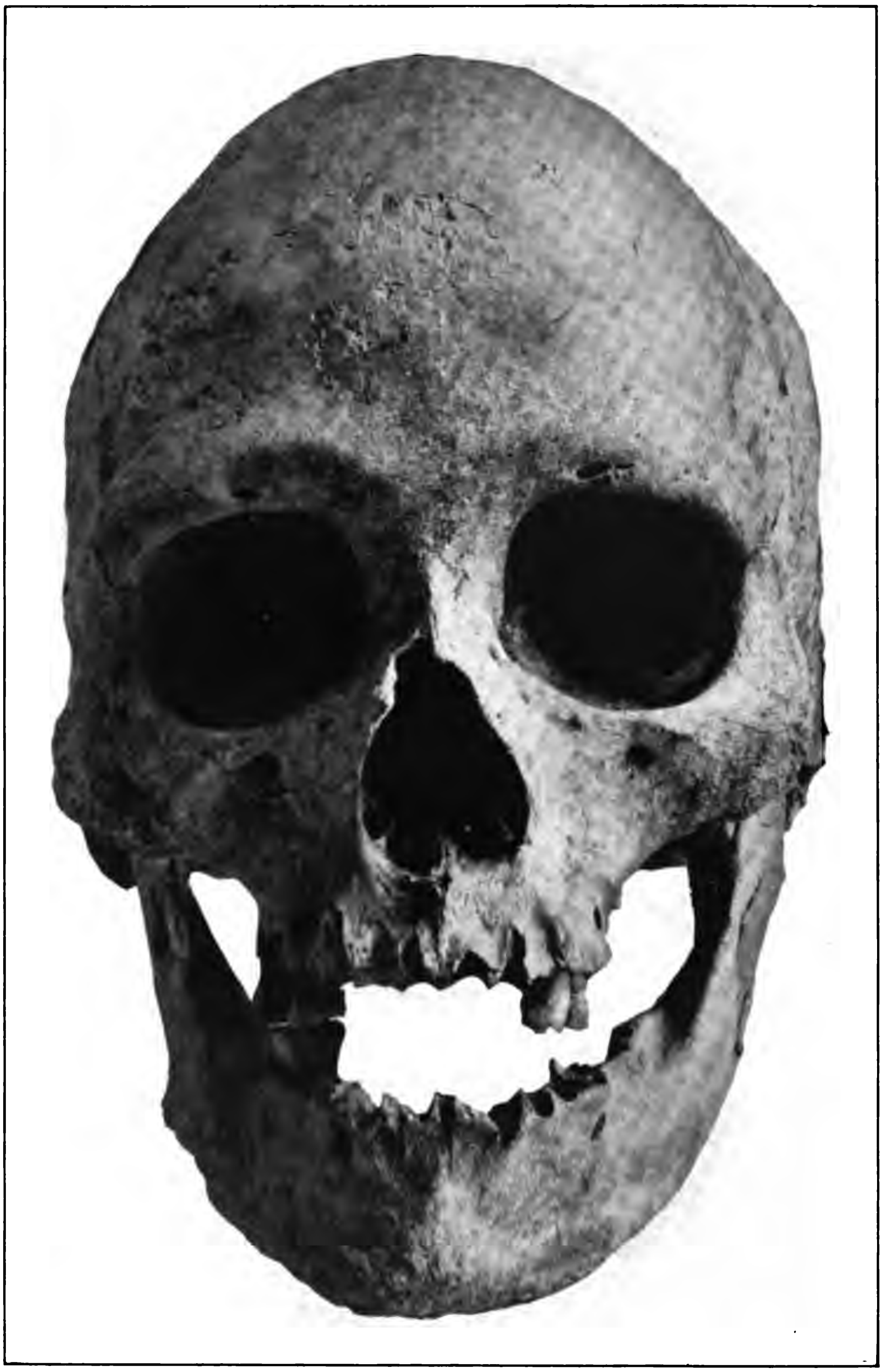
GILBERT COLLECTION, AMHERST COLLEGE. 2946.

Length-Breadth Index 67.68.

This is a male skull from Old Hadley. "Two Indian skeletons dug up from the Indian Burial Ground at Fort Hill in the south part of the town of Old Hadley. Excavated by Dr. Edw. Hitchcock in 1904." This was a twin grave. This skeleton is also figured in the American Anthropologist (N. S.), Vol. VII, No. 2, 1905. The alveolar rim on the right side is shrunken from loss of teeth during life.

The following are the measurements of this skull:

Greatest length	198	mm.
Glabella-inion	196	mm.
Nasion-inion	194	mm.
Frontal arc	140	mm.
“ chord	123	mm.
Parietal arc	115?	mm.
“ chord	102	mm.
Occipital arc	147	mm.
“ chord	106	mm.
Total sagittal arc	398	mm.
Nasion-gnathion	118	mm.
Nasion-prosthion	68	mm.
Orbital height	34	mm.
Nasion-nasospinale	50	mm.
Chin height	33	mm.
Least frontal breadth	97	mm.
Inter-frontomalare temporale	109	mm.
Inter-frontomalare orbitale	99	mm.
Inter-zygomaxillare	99	mm.
Inter-lacrimale	22	mm.
Inter-maxillofrontal	18	mm.
Orbital breadth from the maxillofrontal	43	mm.
Orbital breadth from the dacryon	39	mm.
Orbital breadth from the lacrimale	38	mm.
Nasal breadth	26	mm.
Zygomatic breadth	—	mm.
Auricular breadth	128	mm.
Intercoronal breadth	113	mm.
Greatest cranial breadth	134	mm.
Horizontal circumference over the glabella	555	mm.
Horizontal circumference over the ophryon	537	mm.
Transverse circumference	312	mm.
Nasion-basion	103	mm.
Basion-bregma	133	mm.
Cranial height	133	mm.
Basion-prosthion	102	mm.
Basion-gnathion	117	mm.
Basion-opisthion	37	mm.
Breadth of foramen	30	mm.
Bi-asterial breadth	88	mm.
Bi-mastoid breadth	117?	mm.
Maxillo-alveolar length	57	mm.
“ “ breadth	58	mm.
Palatal length	48	mm.
“ breadth	42	mm.
Auricular height	114	mm.
Condylar breadth	—	mm.
Bi-gonial breadth	—	mm.
Height of ramus	60	mm.
Breadth of ramus	34	mm.
Cranial capacity	—	cc.



Plates IV and V.

The following are the indices derived from these measurements.

Length-breadth	67.68	Superior facial	—
Length-height	67.17	Nasal	52.00
Breadth-height	99.17	Orbital	79.07
Auricular length-height	58.08	Inter-orbital	22.22
Calvarial height	53.61	Maxillo-alveolar	101.75
Transverse frontal	85.84	Palatal	87.50
Transverse fronto-parietal	72.39	Cranio-facial	—
Sagittal fronto-parietal	82.14	Fronto-biorbital	88.99
“ frontal	87.86	Fronto-malar	—
“ parietal	88.70	Malar-mandibular	—
“ occipital	72.11	Fronto-parietal chord	82.93
Total facial	—		

General Description of Skull.

Male, circ. 40 yrs., hyperdolicho-, hypsicephalic, chamaerrhine, chamaeconch, brachystaphyline.

PLATE V.

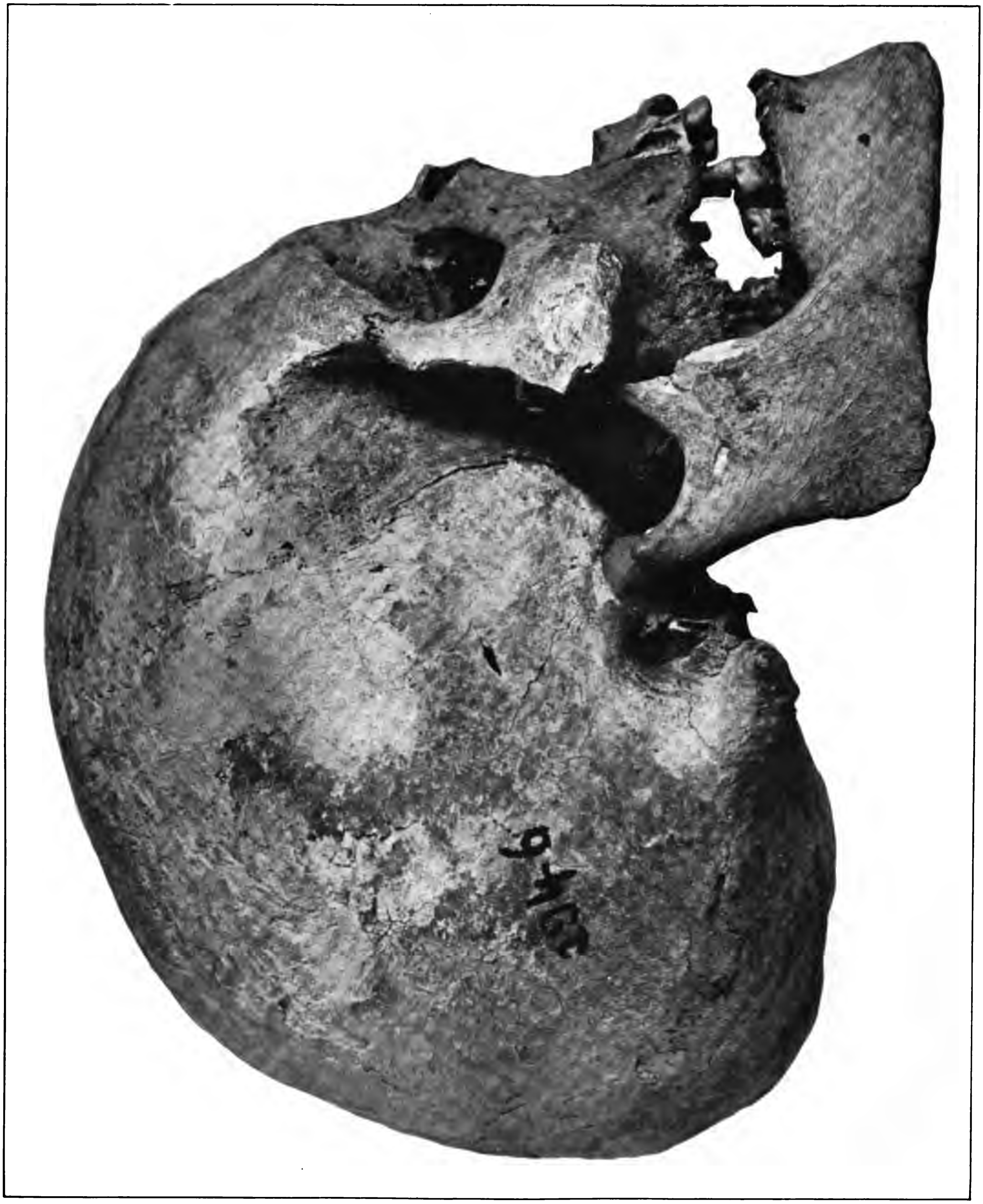


Plate VI.

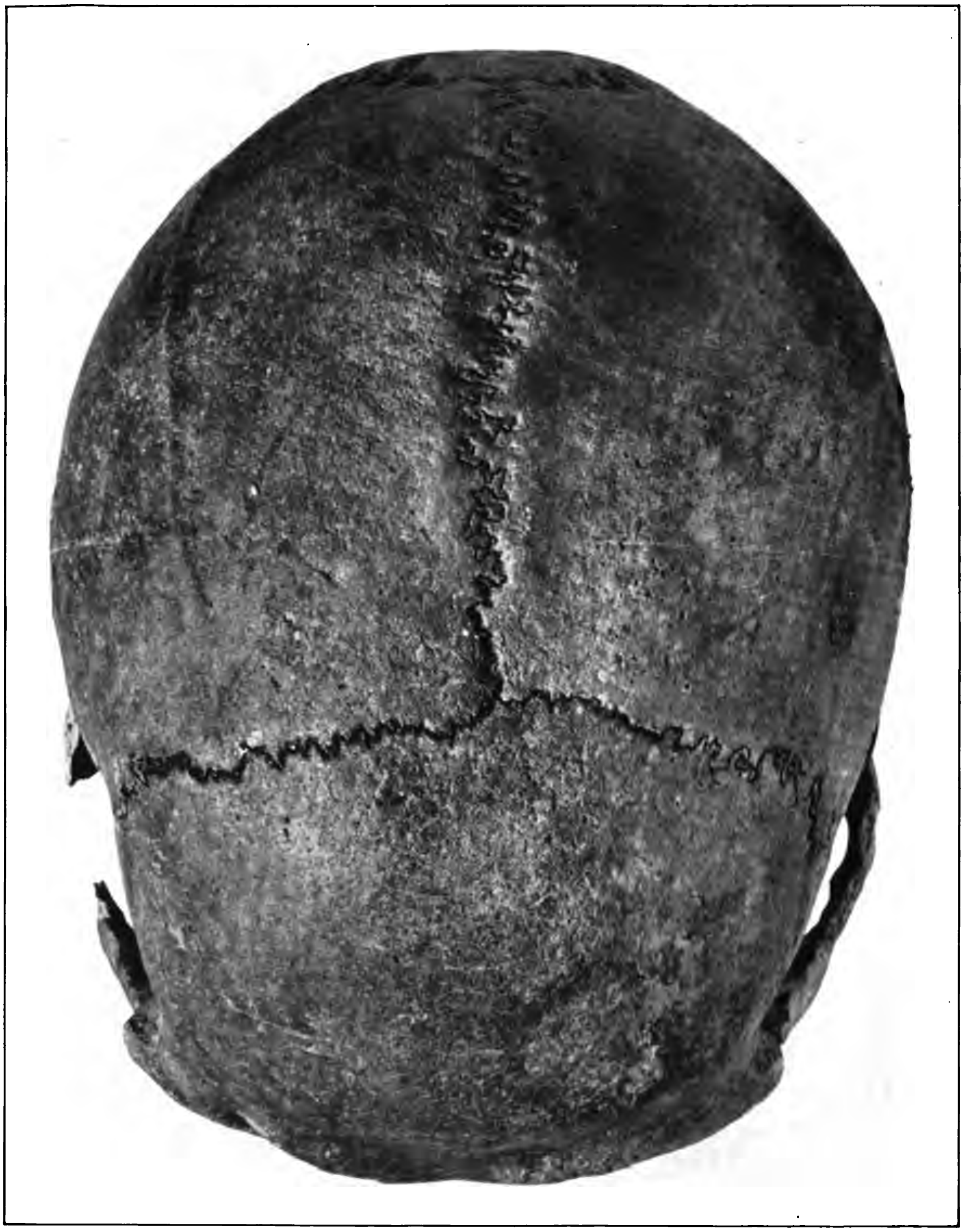
WARREN, RHODE ISLAND.

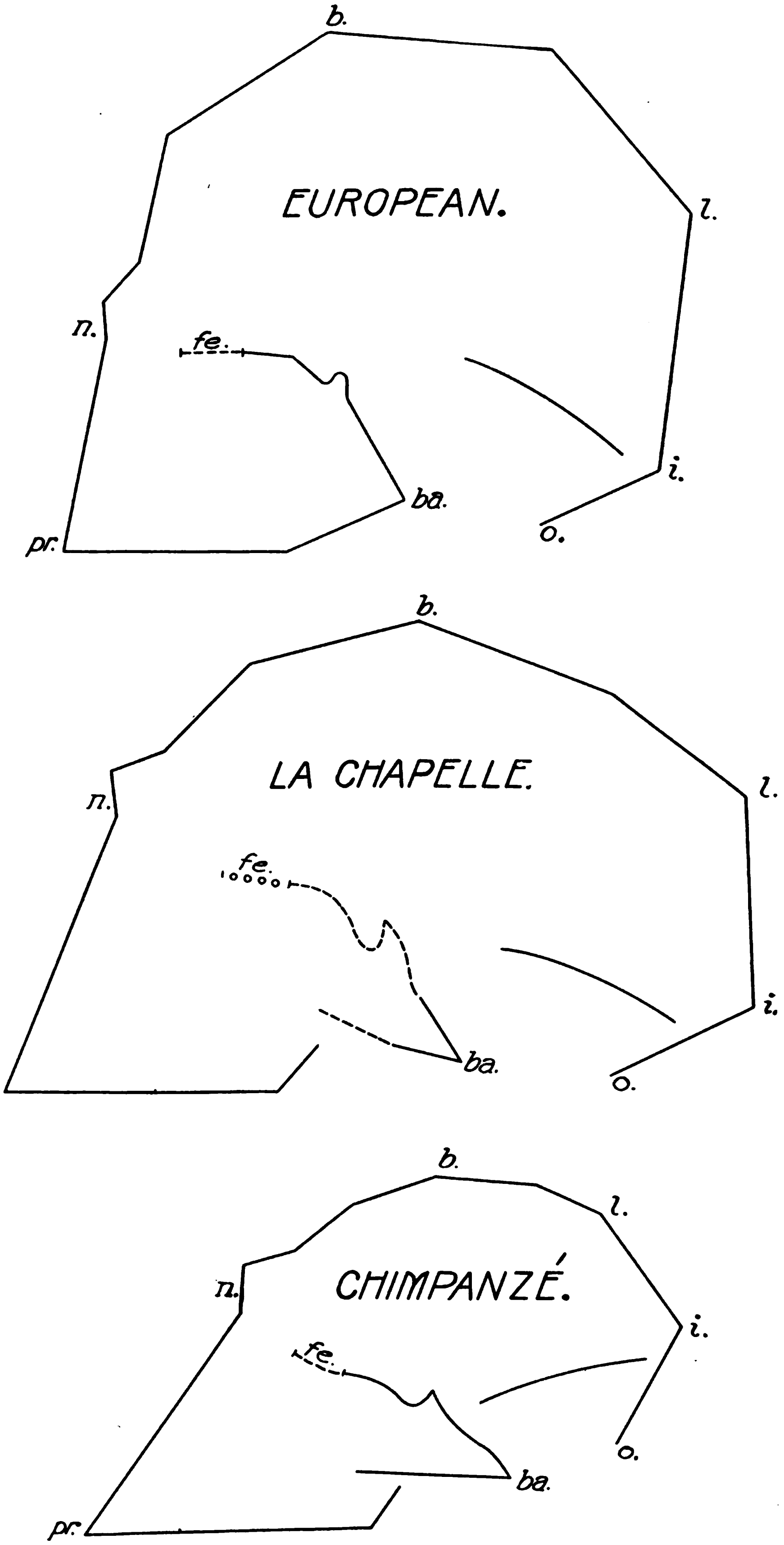
Length-Breadth Index 75.54 No. 25.

This is the top view (norma verticalis) of a skull from Warren, Rhode Island. It is known, from the associated objects found in the graves, that this is one of the Wampanoags of the trade period from 1615 to 1675.

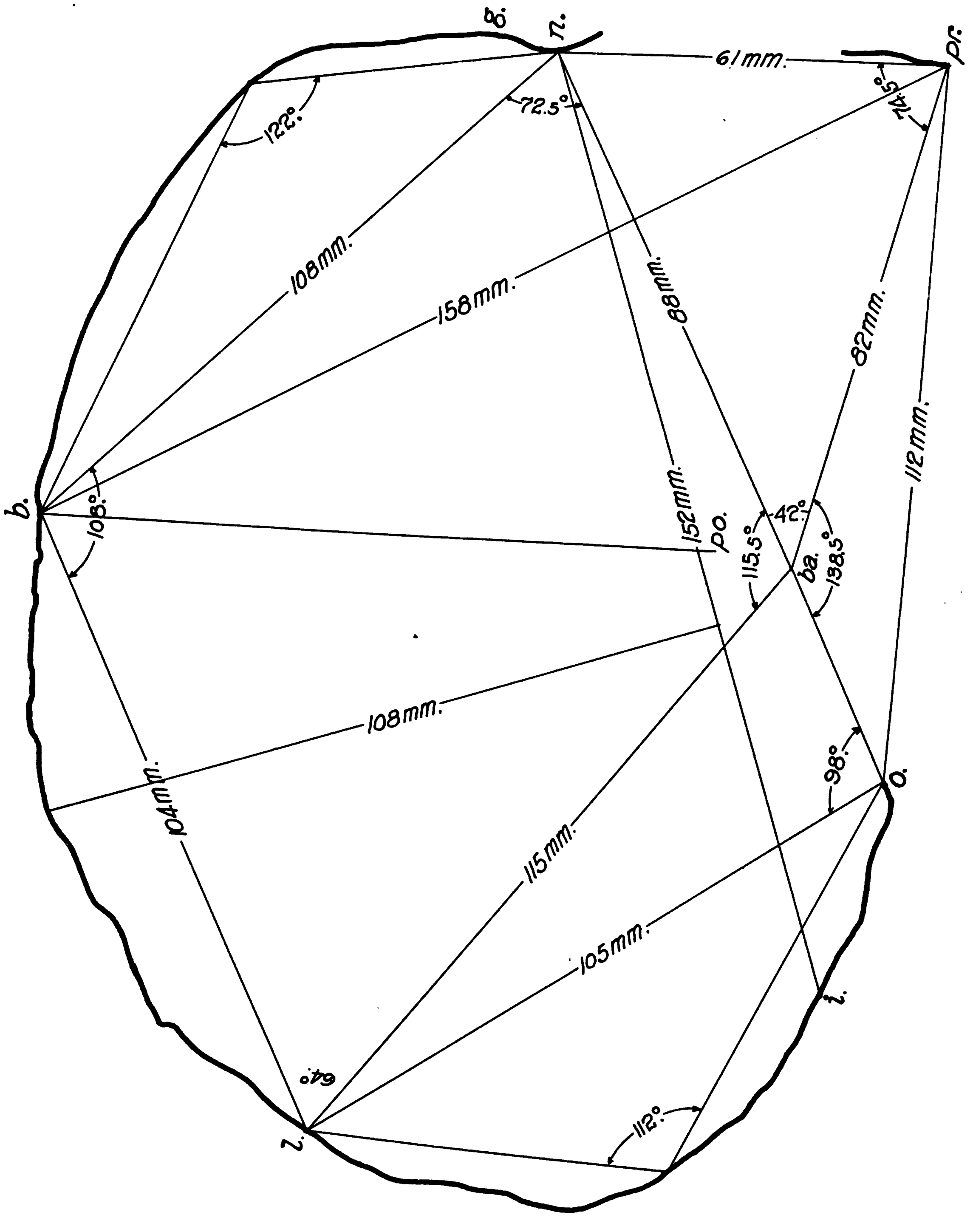
The following are the measurements which can be seen in this view:

Greatest cranial length	184	mm.	Zygomatic breadth	140	mm.
Frontal arc	133	mm.	Auricular breadth	132	mm.
" chord	114	mm.	Intercoronal breadth	114	mm.
Parietal arc	125	mm.	Greatest cranial breadth	139	mm.
" chord	111	mm.	Bi-asterial breadth	114	mm.
Least frontal breadth	94	mm.	Bi-mastoid breadth	118	mm.





Schematic diagrams of cranium of Chimpanzee, a prehistoric man, and modern man – ba. basion; o: opisthion;- i: inion; l: lambda; b: bregma; n: nasion; pr: prosthion; ethmoid fossa. (BOULE) –



GILBERT COLLECTION.

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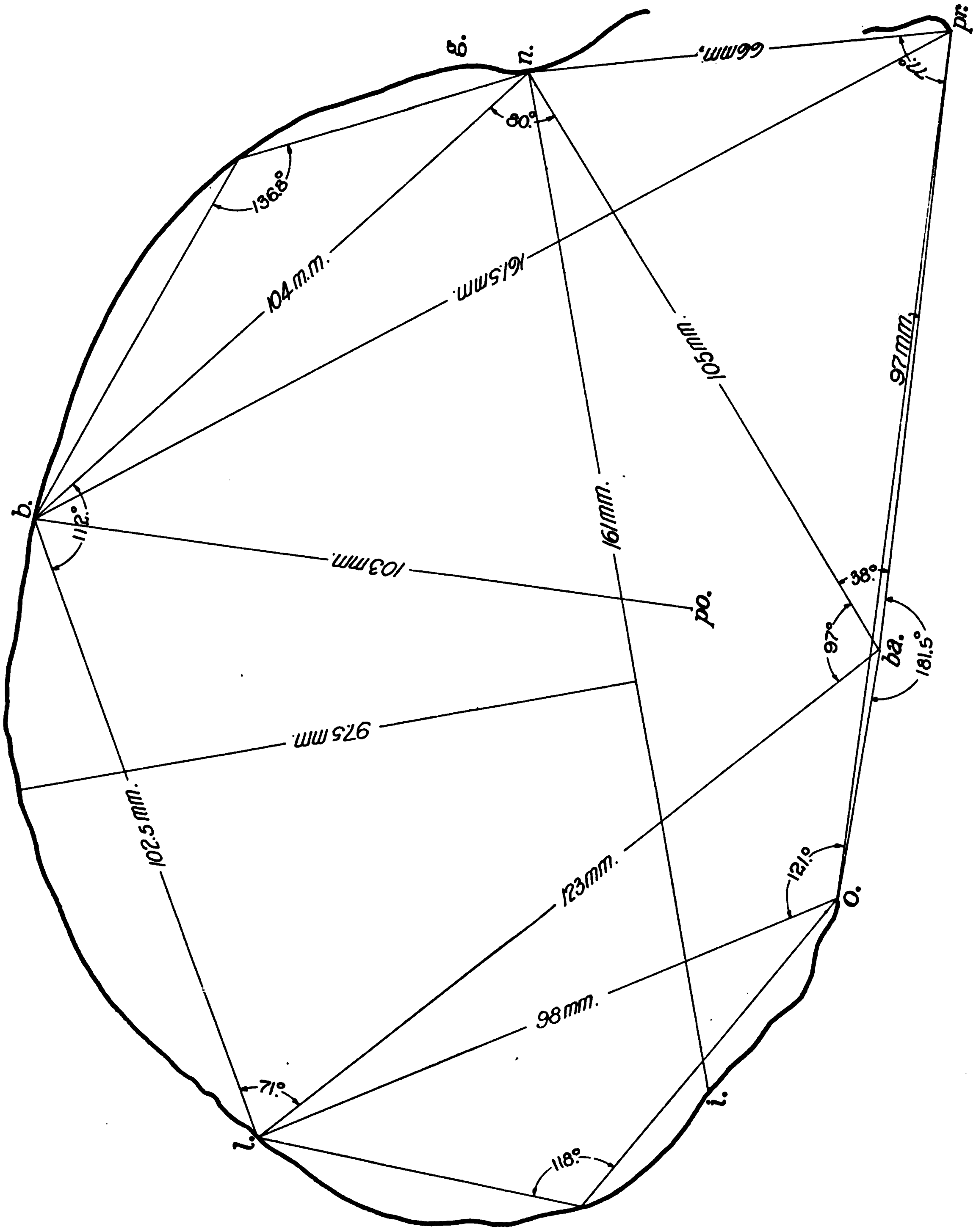

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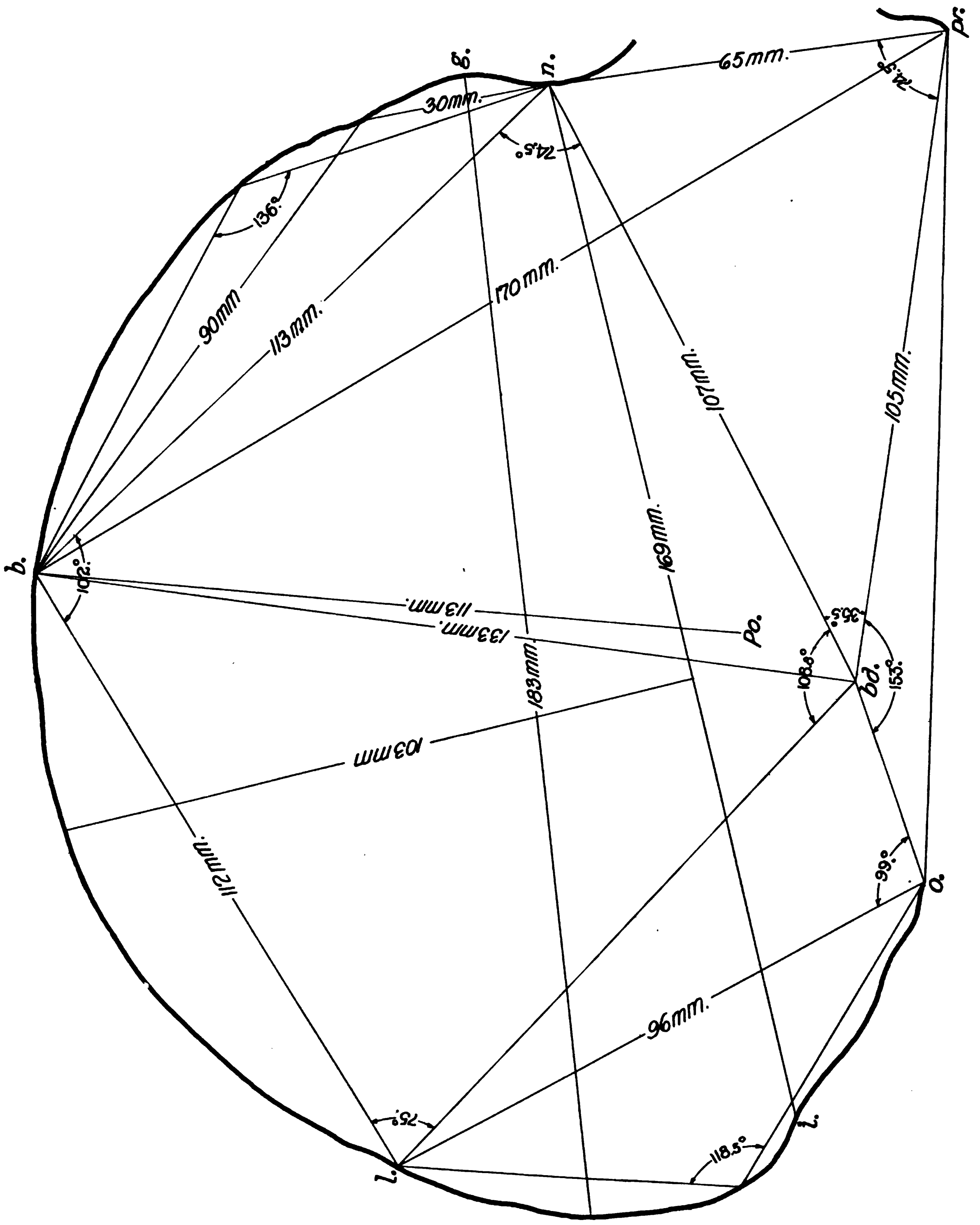

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